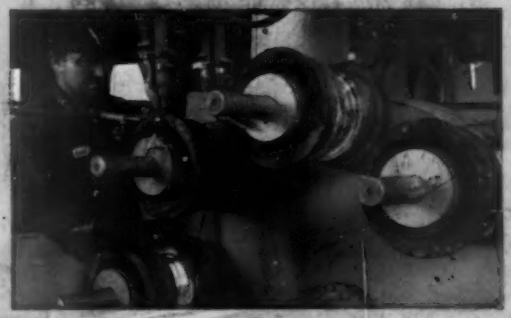
JULY 1960

Welding Design & Fabrication

ESTABLISHED IN 1930 AS INDUSTRY & WELDING



New Horizons For Hardsurfacing

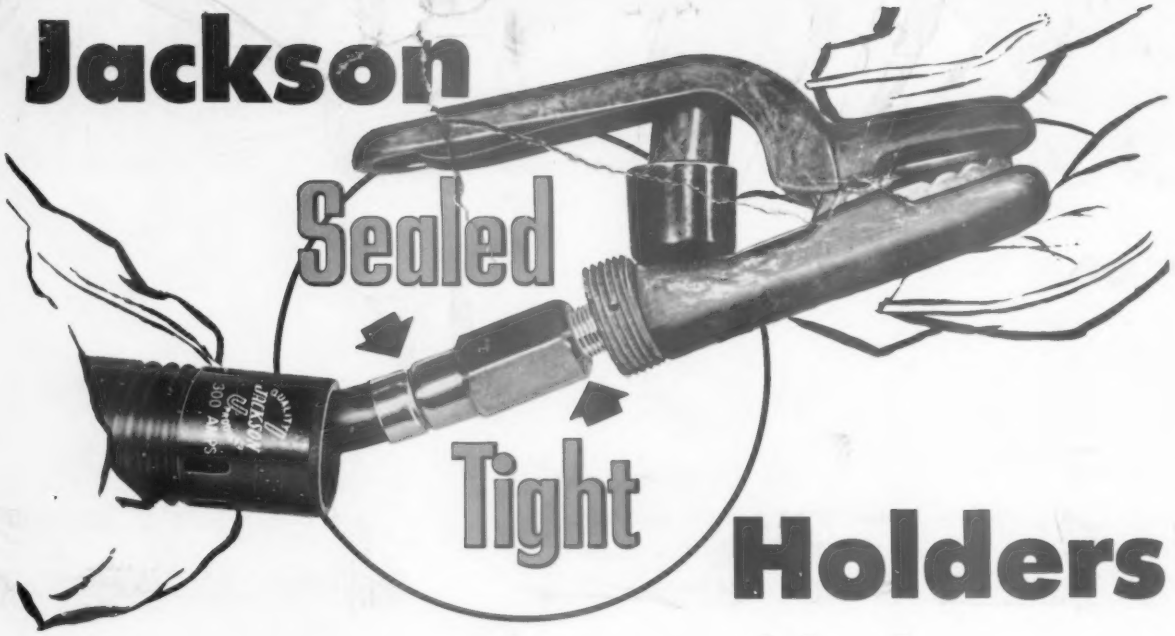
STEVENS RICE
UNIVERSITY MICROFILMS
313 N 1ST ST
ANN ARBOR MICH
#1873

AN INDUSTRIAL PUBLISHING CORPORATION MAGAZINE

ALSO IN THIS ISSUE

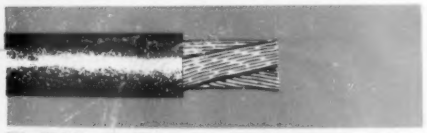
WELDED BRIDGES: NEW HORIZONS FOR HIGH STRENGTH STEELS
EDDY CURRENT TESTING OF SUPERALLOY WELDMENTS
AUTOMATIC FLAME CUTTING S[illegible]0,000 A YEAR

Jackson Sealed Tight Holders

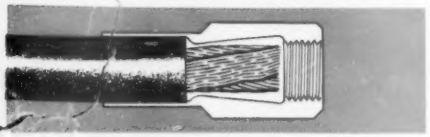


for trouble-free connections

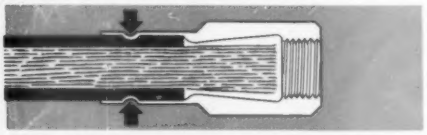
■ *Strip back the cable jacket–*



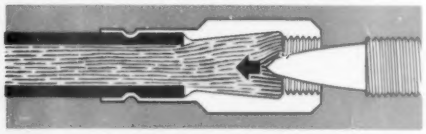
■ *Slide on the connection nut–*



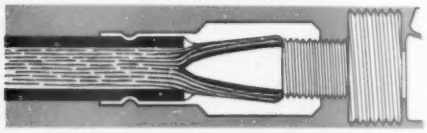
■ *Seal nut with crimping tool–*



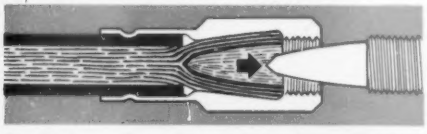
■ *Push holder stud into strands–*



■ *Wrench tightly into place–*



■ *Holder end may be replaced–*

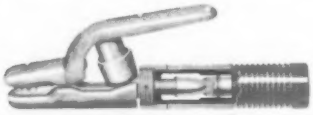


■ *Connection assembly stays put!*

These copper alloy quality Jackson electrode holders have a permanent-type cable connection device good for the life of the cable. It grips the cable jacket as well as the cable, sealing out moisture and dirt. The jacket can't slip back, the strands won't flex and break. The 'stinger end' of the holder can be replaced repeatedly without remaking the connection.

These ST holders are attached to the cable in a simple mechanical way, but the result is an almost fused connection having excellent conductivity.

Get the utmost in conductivity, ease of connection, and long life. Get lower holder costs when buying ST holder stinger end replacements. Get a Jackson Sealed Tight holder in your hands soon and you'll *see* why they're better.



Model ST-3, copper alloy holder for electrodes through ¼" dia. Rated for 300 amps.

Model ST-5 copper alloy holder for electrodes through ⅜" dia. Rated for 500 amps.

See for yourself! Have your dealer show you the ST demonstration kit!

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  wire speed up to 260 inches per minute. (Up to 460 ipm with optional gear box.)
- **LOW COST**
  permits both large and small shops to use the "Manumatic" continuously or part time.

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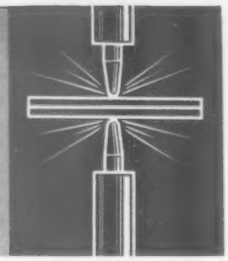
MALLORY MEMOS

NEWS AND TIPS ON RESISTANCE WELDING

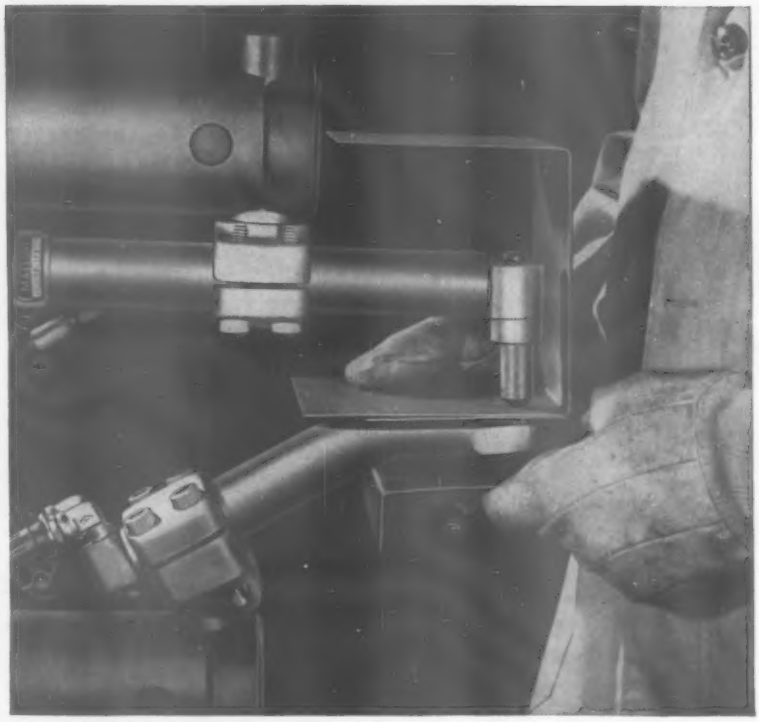
Mallory Metallurgical Company, Indianapolis 6, Indiana



WELDING HINTS

SPECIALLY PRICED HOLDER KITS simplify set-up for short-run welding. Ideal for small shops, maintenance shops, engineering model shops . . . and for big shops handling occasional short runs. Gives you a selection of holder barrels and adapters that lets you make a variety of set-ups. 11 different kits available. Buying complete kit saves you *nearly half* the cost of parts if purchased separately . . . prevents delays, assures the holder you want when you want it.

COMPLETE, HANDY LISTING OF ALL MALLORY ELECTRODES in this latest 32-page catalog, helps you choose the electrodes you need to fit any welding job. Full of helpful recommendations on electrode alloys to use with various metals, how to dress electrode tips, welding schedules for seam and spot welding of stainless and low carbon steels, design data and welding requirements for projection welds. Get a copy from your distributor.



"Tight Squeeze" welds are easy...with

STANDARD MALLORY COMPONENTS

The resistance welding operation shown here may look special. But . . . there's no need for special holders and electrodes; you can do the job with standard, economical Mallory components. On the upper arm is a standard Mallory 100 Series straight holder with 90° adapter head, and a straight truncated cone tip electrode. The lower assembly is a 950 Series paddle type holder, with a socket type flat faced electrode.

Before you go to the extra time and trouble to order special welding components for a job that looks tricky, check what you can do with standard Mallory items. Immediately available at economical price are over 200 different electrodes...straight, single bend, double bend, swivel, offset, irregular shapes . . . and a line of holders including straight, universal, low inertia, heavy duty and paddle types. You can put these together in thousands of combinations to fit just about any job in your shop. And when you use Mallory supplies, you're sure of service. Our alloys and designs are the result of over 30 years of pioneering in resistance welding.

MALLORY RESISTANCE WELDING PRODUCTS ARE AVAILABLE FROM AUTHORIZED DISTRIBUTORS LOCATED IN ALL PRINCIPAL CITIES

For More Information Circle No. 43 on Reader Service Card.

reader's guide to

for July, 1960

COVER: A very conservative estimate of how much hardsurfacing saved industry in the past year is $100 million. But this figure is only a fraction of the savings available to industry through hardsurfacing. It can literally save billions once machine builders and other users become aware of the developments in alloys, equipment, and techniques . . . and how a spot of carefully selected hardsurfacing alloy can add many lives to equipment parts. That's the reason for our report which begins on page 27 of this issue. It's designed to bring you up to date on materials, trends, and applications in hardsurfacing.

27 SPECIAL REPORT **NEW HORIZONS FOR HARDSURFACING**

Industry is realizing that hardsurfacing is a major source of big savings. With it they are guarding equipment parts against damage by abrasion, impact, heat, and corrosion.

28 $100 MILLION, AND IT'S ONLY THE BEGINNING

Composite answers by hardsurfacing industry leaders tell the industry's size today, how much it will grow in ten years, how much it saves industry, and tomorrow's trends.

30 HARDSURFACING INDUSTRY: FROM OUNCES TO MULTI-TON DEPOSITS

Hardsurfacing applications range from manual deposits on tiny parts to multi-ton deposits made on giant shovels and blast furnace equipment with automatic and semiautomatic equipment.

FEATURES

34 WELDED BRIDGES: A BIG FUTURE FOR HIGH STRENGTH STEELS

Welded bridges made from high strength steels give designers an entirely new system of design; weight is saved, fabrication is simpler and more economical, and appearance is better.

37 HOW TO WELD MOLYBDENUM

The conclusion of a three-part series explains how this jet-age metal is resistance welded.

41 EDDY CURRENT TESTING OF SUPERALLOY WELDMENTS

Weld inspection breakthrough is expected to help develop new techniques for fabricating the difficult-to-weld superalloys.

43 NEW WELDED PONTOON IS STRONGER, LIGHTER, CHEAPER

Baldwin-Lima-Hamilton builds useful pontoons that ship knocked down and nested for waterside assembly and welding.

45 ANALYZE WELDMENT STRESSES THE NEW WAY

Unique plastic material translates strain levels into contrasting colors which can be interpreted in terms of stress, load, pressure, torque, or force.

46 AUTOMATIC FLAME CUTTING SAVES $10,000 A YEAR

Automatic shape cutter reduces labor costs, increases machine efficiency, and lowers template costs.

48 QUENCHED ARC CUTTING: A NEW WAY TO CUT THIN-METAL PARTS

Unique electrical process results in new line of machine tools for machining honeycomb, foil, and other thin metal.

50 REPAIR-WELDED PRESS BASE COSTS $1,084 LESS THAN A NEW ONE

Welded repair of a cast drill press base costs only $216 and eliminates a long wait for a new one.

DEPARTMENTS

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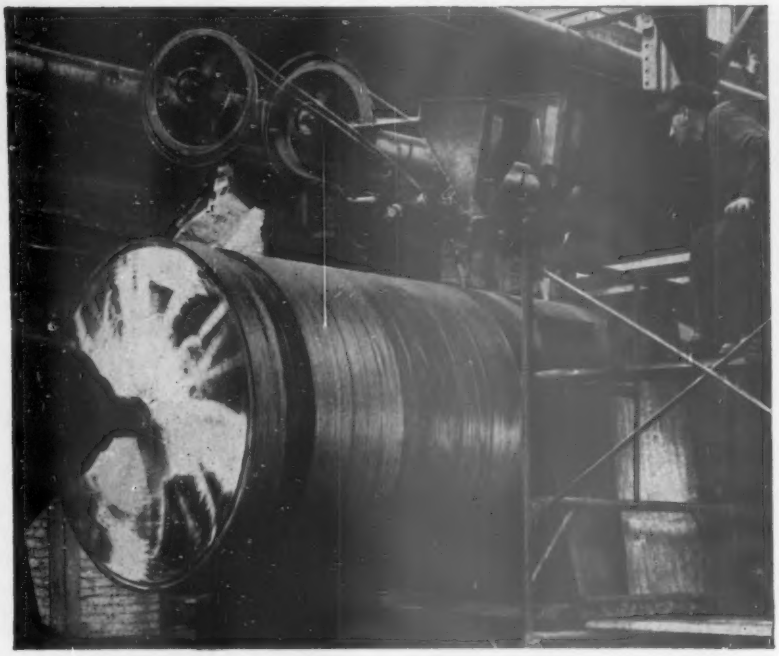

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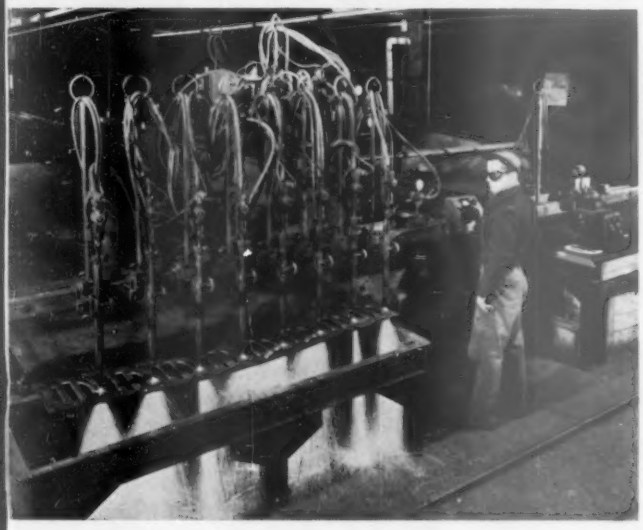
WELDING AT WORK

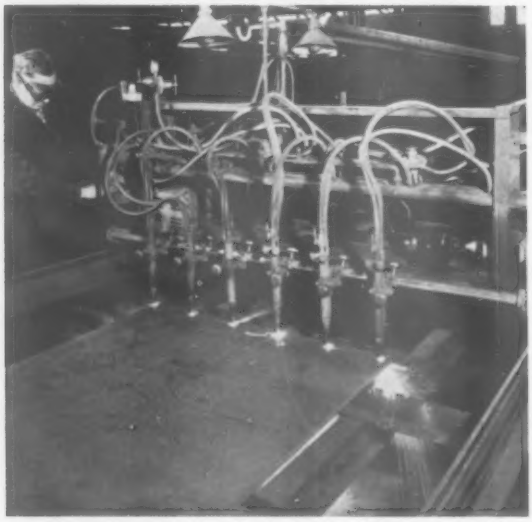
to do the job better and cheaper

Army missiles use new, light gages of T-1 steel

FT. BENNING, GA.: Lightweight structural members made from newly developed thin-gage sections of U. S. Steel's T-1 constructional alloy steel give this erector-launcher for the Army's Sergeant missile the strength to take harsh field abuse, yet make it light enough to be transported by air.

These new light gages are heat treated at the mill to a yield strength of 100,000 psi. They have about three times the yield strength of structural carbon steel rolled to the same thickness and weight. Moreover, the thin sections can be readily formed and welded without any loss of strength.





Cleveland fabricating firm cuts with natural gas

CLEVELAND, OHIO: "At first, we didn't believe all the claims the Harris Calorific people made for flame cutting with natural gas," said Al Rapp, assistant plant superintendent at Patterson-Leitch Co. "But when we converted to this cheaper fuel gas we still got good, high quality cuts at satisfactory speeds."

Multi-torch cutting (above, left) using Harris machine-cutting torches and an oxygen-saver reduced preheat oxygen consumption and still gave fast starts. The unusual cutting machine (above, right) was developed by Patterson-Leitch for cutting long steel shapes.

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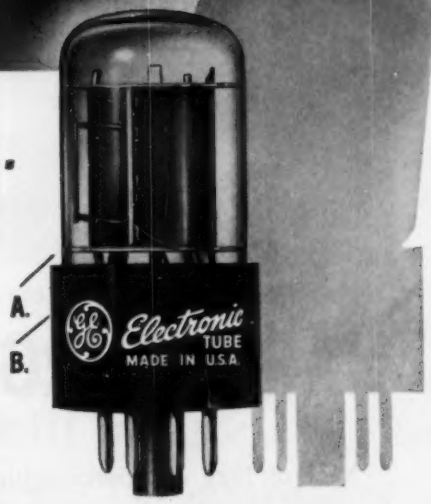
You can't beat it for performance....
You can't equal it for ruggedness....

NEW G-E 2050-A THYRATRON



Why install a welding-control tube with outmoded design (16 years old), when you can have a thyratron as new as up-to-the-minute engineering can make it? General Electric's 2050-A gives you, in its trim, compact envelope, greater tube strength and improved reliability...*at no price increase.*

Socket-wise, the new tube is fully interchangeable with Type 2050. Electrical characteristics are the same. To assure high welder output in your plant, take this no-extra-cost step ...ask your General Electric tube distributor to deliver new 2050-A's on all your replacement orders, starting immediately! *Distributor Sales, Electronic Components Division, General Electric Company, Owensboro, Kentucky.*

30% SHORTER THAN 2050 (RIGHT)... FAR STURDIER!

Also 18% less diameter. Greater compactness adds strength to withstand vibration. The new 2050-A is your tube for tough welding-control service!

A. DOUBLE BRACING OF TUBE STRUCTURE! See how the 2050-A bottom mica fits snugly against the glass envelope—unlike the 2050 mica, which "floats". Tube cage is held firmly in place.

B. MODERN BUTTON-STEM BASE! Clean, compact base design means short leads that are all internal, requiring no "spaghetti" insulation as found in the old-style long-lead 2050.

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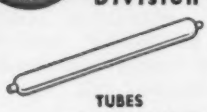

TUBES

TRANSPORTS

FLANGES

COUPLINGS

For More Information Circle No. 27 on Reader Service Card.

MEN ON THE MOVE

in the welding industry

PROMOTIONS:

CAINE

FRIEDLY

Harold P. Caine has been named manager of the Southern Region for Eutectic Welding Alloys Corp., Flushing, N. Y. He joined Eutectic in 1957.

Robert C. Friedly has been named general sales manager for products of Gregory Industries, Inc., Lorain, Ohio. He will coordinate sales activities for Gregory's Nelson Stud Welding Division, Nelson Stud Driver Division and its Bulldog (concrete fastener) Division.

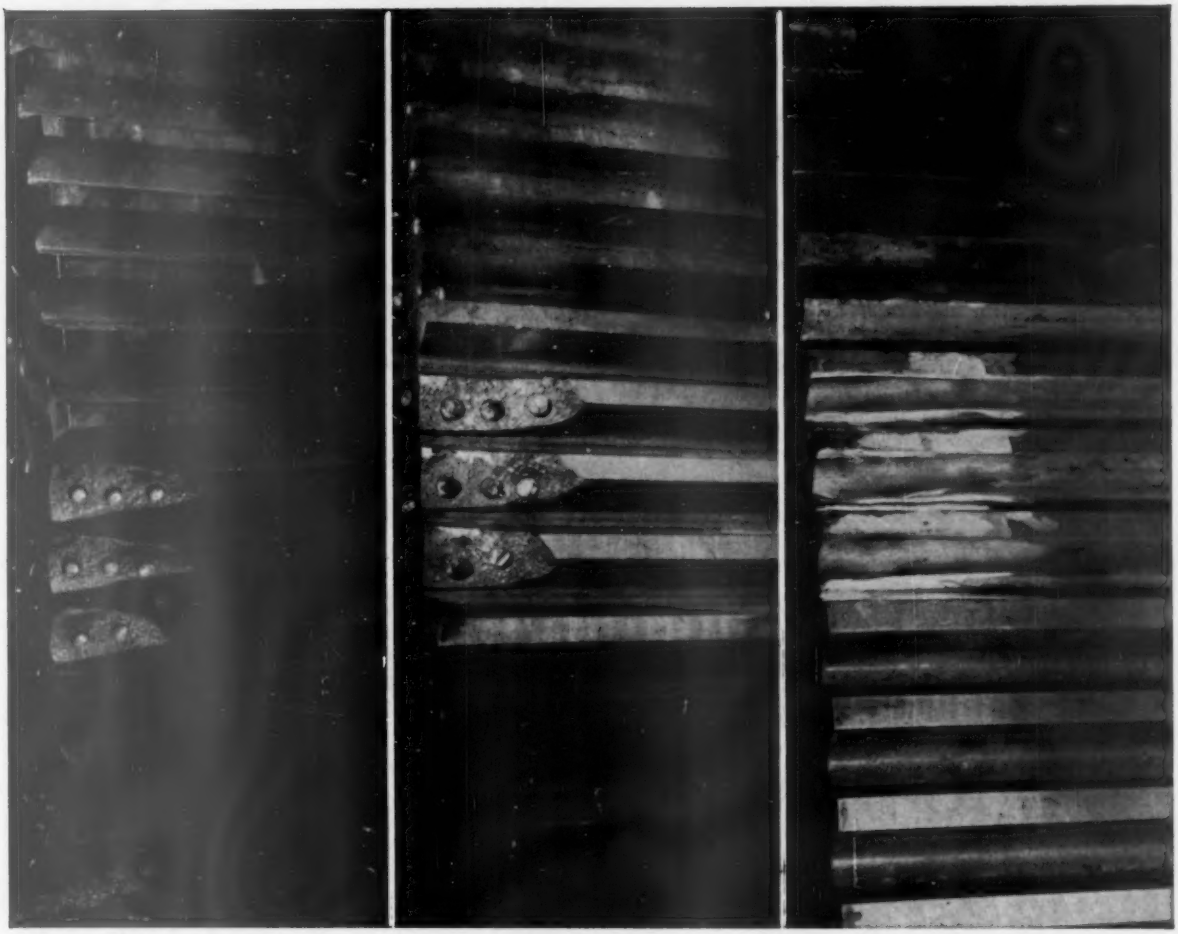
Otis H. Young has been named manager of the West Central Region for the Welding Products Division of Metal & Thermit Corp. His headquarters will be in East Chicago, Indiana.

MADSEN

Orla Madsen has been named chief engineer at C. B. Herrick Mfg. Corp., Cleveland, Ohio. He had been chief electrical engineer for the past five years. Born in Denmark, Madsen has accumulated a variety of experience in Canada and other foreign countries.

Lincoln D. Hall is manager of a newly created Midwest District with headquarters in Kansas City, Mo., according to an announcement by Tube Turns Division of Chemetron Corp.

continued on page 10



Broken teeth are drilled... tapped and studded... welded with Ni-Rod "55", ground to size

Repair with Ni-Rod "55" Electrode saves 13-ft cast iron mill gear

. . . saves $2000 new gear cost
. . . saves tough replacement job
. . . saves $8000 per day down time

Again, Ni-Rod "55"* Electrode turns a huge problem into a relatively small repair job. The 13-ft cast iron gear in the pictures above turns a power station coal pulverizing mill. One day, its pinion gear shaft broke – and stripped off three teeth before the mill could be shut down.

Replacement was impractical—meant making a gear-sized hole in a thick concrete wall, purchase of a new $2000 cast gear, and a long wait costing $8000 per day.

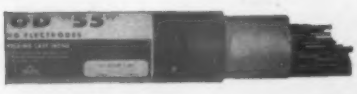
Repair was the answer – in 5 hours, weldors studded the teeth to improve the foundation; built up a Ni-Rod "55" deposit; ground the deposit to size. Cost – about $230. Today, after more than two years of service, there's no sign of failure.

Ni-Rod "55" Electrode helps you make solid repairs in cast irons – solid production welds, too. Rarely do you need preheat to get sound, strong, machinable joints.

Booklet *"Repair Cast Iron Parts Quickly and Easily"* shows how other shops have pared costs on repairs and production. Yours for the asking, from

*Inco trademark

HUNTINGTON ALLOY PRODUCTS DIVISION
The International Nickel Company, Inc.
Huntington 17, West Virginia



INCO WELDING PRODUCTS
TRADE MARK
ELECTRODES • WIRES • FLUXES

For More Information Circle No. 35 on Reader Service Card.

DO YOU BELIEVE IN

MAKING A PROFIT?

PROFIT MEANS BETTER WELDING SERVICE AND BETTER WELDING SERVICE MEANS

MORE PROFIT FOR YOU!

Your local welding supplier must make a profit on his sales to you, so that he can provide you with the "know how" to help you solve new and complex welding problems. Remember that when you ask for quotations...

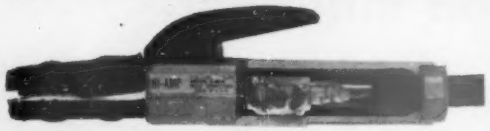
Call Your

Local Welding Distributor

- HE KNOWS THE BEST SOLUTION
- HE GIVES YOU QUICK SERVICE
- HE MAINTAINS A GOOD INVENTORY

he'll explain how

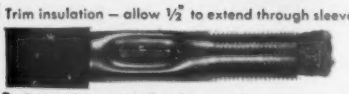
TPC* MAKES HI-AMP® ACCESSORIES COOLER



*THREADED POWER CONNECTION

2 Slip on threaded sleeve

1 Trim insulation – allow ½" to extend through sleeve



3 Crimp sleeve with Swedg-on tool

Screw sleeve into cable socket. (The ½" of cable strands will be forced against the holder tong member which gives another point of direct contact for good connection.)

Write for FREE booklet "Reducing Costs By Proper Care Of Arc-Welding Circuits"

LENCO, INC.

354 W. ADAMS ST. JACKSON, MO.

For More Information Circle No. 38 on Reader Service Card.

MEN ON THE MOVE

continued from page 8

PROMOTIONS:

Progressive Welder and Machine Co. has announced the appointment of **William B. Payne** as general sales manager of the company's newly consolidated six divisions.

FEY

Stanley E. Fey has been appointed general manager of the K-G Equipment Co., Division of Air Products, Inc., Allentown, Pa. Fey had been general manager of the Industrial and Medical Gas Division of Air Products and has been associated with the welding industry since 1926.

Ralph H. Engstrom and **Robert E. Poethig** were named vice presidents at Bastian-Blessing Co., Chicago.

Harold D. Ballard has joined the sales force of Lincoln Electric Co., Cleveland. He will work out of Lincoln's Milwaukee office replacing **Donald E. Bly** who was transferred to Appleton, Wisconsin.

Kenneth G. Dicker has been appointed assistant to the manager of the Midwestern Region for National Cylinder Gas Division of Chemetron Corp.

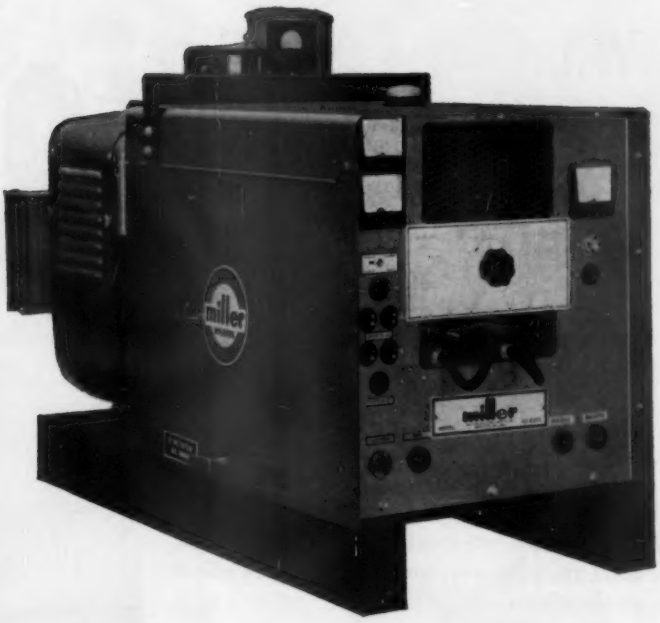
ELECTIONS:

Henry S. Wingate, president of the International Nickel Co. of Canada, Ltd., since 1954 and a director since 1942, has been elected chairman of the board. **J. Roy Gordon** has been elected president, succeeding Mr. Wingate.

Charles J. Haines, president of Chemetron Corp. for 23 years, was elected to the newly created position of chairman of the board and chief executive officer. **James W. Dunham** was elected president.

continued on page 12

NEWEST OF THE GREAT NEW MILLER WELDER/POWER PLANTS



AD-225-L
GASOLINE ENGINE-DRIVEN AC/DC WELDER/POWER PLANT

miller WELDERS

This is as close to being "an all-around hand" as you're ever likely to find. For instance:

A-C or D-C WELDING. The AD-225-L produces 300 amperes at 30 volts a-c or 225 amperes at 30 volts d-c – both at 100% duty cycle. Ample open circuit voltage gives superior results with a-c, d-c or a-c/d-c electrodes.

METALLIC INERT GAS WELDING. Using the d-c side of the AD-225-L, and with new style hand guns feeding small diameter wire from spools, aluminum, mild or stainless steel may be welded by the MIG process. Power for the gun is provided by the 115 volt d-c outlet.

A-C POWER PLANT. As an a-c power plant, this model produces 7 KW of 115/230v single phase 60 cycle current. In areas without electric power, the AD-225-L has proved to be a reliable and economical source of current for lights, appliances and tools.

AUXILIARY D-C POWER. While welding, the AD-225-L delivers 1 KW of 115v d-c which is ample for operation of flood lights, power tools, etc. Other uses to which this versatile model has been put most successfully include thawing of frozen water pipes, warming of viscous fluid for pumping, battery charging and, with addition of model HF-200 high frequency unit, tungsten inert gas welding.

Complete information sent promptly.

miller ELECTRIC MANUFACTURING CO., INC., APPLETON, WISCONSIN

Distributed in Canada by Canadian Liquid Air Co., Ltd., Montreal • EXPORT OFFICE: 250 West 57th St., New York 19, N. Y.

For More Information Circle No. 47 on Reader Service Card.

What Hackney quality means to you

- Maintenance costs cut—smooth surfaces clean easily, paint quickly.
- Eye appeal—no crevices, cracks or ridges. Modern appearance for industrial and medical applications.
- Uniform capacity, controlled weight—filling, handling and record-keeping are simpler.
- Rugged construction that lasts. Hackney has spelled quality since 1902.
- Far exceeds ICC specifications.
- Sound investment. Hackney quality costs no more, and it gives you extra features: accurate threading, neater appearance and legible stamping.
- Complete range of sizes and shapes—from small medicals to 220's, 250's and 300's (cu. ft.).
- Central shipping location means faster service, with less freight charges.

Economical, strong, safe Hackney cylinders are your dependable shipping containers for compressed industrial gases. Your nearest Hackney representative will be glad to give you complete specifications and quote prices.

Pressed Steel Tank Company

Manufacturer of Hackney Products Since 1902

1473 South 66th Street, Milwaukee 14, Wisconsin

Branch Offices

New York, N.Y. · Atlanta, Ga. · Orlando, Fla. · Columbus, O. · Chicago, Ill. · St. Louis, Mo. · Marshfield, Mass. · Downingtown, Pa. · Detroit, Mich. · Los Angeles, Calif.

CONTAINERS AND PRESSURE VESSELS FOR GASES, LIQUIDS AND SOLIDS

For More Information Circle No. 51 on Reader Service Card.

MEN ON THE MOVE

continued from page 10

SORENSON, above

ROMO, above, right

BRAUCHT, right

APPOINTMENTS:

Eutectic Welding Alloys Corp. has named **William F. Sorensen** distribution manager. He will be in charge of the company's nationwide service and training centers. At the same time **Robert C. Romo** was named manager of Eutectic's new service and training center in Minneapolis.

Rankin Mfg. Company has appointed **T. C. (Ted) Braucht** manager of its Southern District with headquarters in the Dallas-Fort Worth area.

Appointment of **Othmar W. Sailer** as director of marketing has been announced by Unitek Corp., Monrovia, Calif. The company also made **Don A. Drake** advertising and sales promotion manager.

S. W. (Steve) McNeill has been appointed factory representative for National Welding Equipment Co., San Francisco. He will represent the company in Southern California, Nevada, Arizona, and New Mexico.

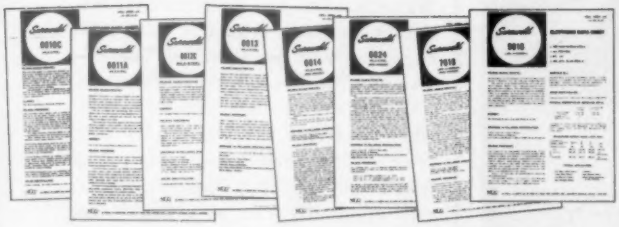
Herbert L. Martin has been appointed field representative for the Arcair Company in the Central States.

continued on page 14

Circle No. 50 on Reader Service Card. ⟶

when you weld...
use *Sureweld*®
ELECTRODES

No matter what the job, there's a Sureweld Electrode to do it better. Want slow burn off rate to fast bead deposition rate with maximum penetration? Want slow and cool deposition with minimum penetration? Want special alloying or shielding characteristics? Whatever you want, you can get it in Sureweld Electrodes.



NEW . . . Sureweld Electrode Data Sheets. Complete and detailed information on each electrode . . . welding characteristics, welding procedures, color identifications, physical properties of deposited metal, recommended current ranges per stock sizes, etc. Just write today outlining the applications in which you are interested and we will be happy to forward data sheets to meet your needs. There is no obligation.

NEW . . . A completely re-designed package. All Sureweld Electrodes are now packaged in this handsome, strong, moisture-resistant carton providing maximum protection. In addition, for your convenience, easy access has been provided. With a simple pull of the "Zipper", about one-third of the carton comes away, and the electrodes are instantly available for use. Automatically you have a temporary storage facility that can be moved easily from job to job.

SUREWELD 6014 ELECTRODE:

An all position electrode for mild steel, it operates equally well on AC or DC. Approximately one-sixth of the deposited metal comes from the coating of this electrode, a thick coating with a substantial percentage of iron powder. The balance of the metal deposited comes from the core wire. In addition, the heavier coating has substantial heat capacity which permits higher current rates without damage to the coating. The result is an increase of 20% to 40% in deposition rate.

The "drag technique" may be used with Sureweld 6014 electrodes, with the tip held in contact with the plate, or with a free arc. These electrodes have found wide use for welding construction equipment, sheet metal, farm implements, foundry equipment, pressure vessels, pipe and fittings, etc.

This is only some of the information contained on the Sureweld 6014 Electrode Data Sheet . . . get this and others by writing or calling your nearby NCG office today.

NCG®

NATIONAL CYLINDER GAS

DIVISION OF
CHEMETRON CORPORATION CHEMETRON

840 N. Michigan Ave., Dept. E-3G, Chicago 11, Illinois

NCG sales offices and authorized dealers are located in all principal cities. Consult the yellow pages for the office nearest you.

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New Hi-Impact Plastic Insulated

Panel Receptacles and Mating Plugs

Now, you can make fast, positive power connections to any metal panel or housing without special insulating materials. Simply punch out a hole and insert a Cam-Lok self-insulated Receptacle! Uses standard electrical lock-nuts, affords "dead-front" protection. Push in and twist Cam-Lok mating Plug and you've made a locked connection, which can be released quickly.

New Cam-Lok Receptacles eliminate costs of special insulating panels and reduce assembly time. Patented, high-pressure contact assures minimum resistance and heating.

Cam-Lok has a complete line of Receptacles and Plugs in many sizes and designs. Standard and special purpose Power Distribution Connections are available. Write today for new Bulletin No. 301.

"Dead Front" design for fast
direct mounting on . . .

- ELECTRICAL DISTRIBUTION PANELS
- SWITCHGEAR
- BUS DUCT
- JUNCTION BOXES
- WIREWAY or any electrical cubicle

cam-lok
DIVISION

EMPIRE PRODUCTS, INC.
P.O. BOX U-98
CINCINNATI 36, OHIO

For More Information Circle No. 12 on Reader Service Card.

MEN ON THE MOVE

continued from page 12

AURBACH

JOSEPH

Industrial Publishing Elects Top Officers

CLEVELAND: Lester P. Aurbach has been elected president and Edwin M. Joseph executive vice president of WELDING DESIGN & FABRICATION'S parent company. Aurbach, until now executive vice president of our 30-year old firm, recently celebrated his 25th anniversary with the firm. He succeeds Irving B. Hexter who died recently. Aurbach joined the Industrial Publishing Corporation in 1935, was appointed vice president three years later, executive vice president in 1952.

Joseph joined the company in 1945 as general manager of *Occuptional Hazards* magazine. He was named a vice president in 1952 and first vice president in 1959.

HONORS:

James F. Lincoln, chairman of the board, Lincoln Electric Co., Cleveland, received Ohio State University's Sullivant Medal at recent commencement exercises. The medal is awarded once every five years for notable achievement in the arts and sciences.

RETIREMENTS:

W. Spraragen has retired as director of the Welding Research Council of the Engineering Foundation. He has been succeeded by **Kenneth H. Koopman,** who had been assistant director.

DEATHS:

Frederick W. Walters, founder and chairman of the board of Steel Sales Corp., Chicago, died suddenly last May. He had been associated with the metals industry since 1905.

LIBRARY

of welding

Inspection of Ship Welds

"The Investigation of Radioisotopes for the Inspection of Ship Welds." E. L. Criscuolo, D. P. Case, and D. Polansky, Naval Ordance Laboratory. Feb., 1958, 61 pp. Order PB 161324 from OTS U.S. Department of Commerce, Washington 25, D. C., $1.75.

Isotopes and thulium 170, cesium 137, cobalt 60, and iridium 192 were explored to discover the best non-destructive, radio-graphic technique for inspecting ½ to 2 inch steel plate for ship hulls. Most of this Navy report is devoted to technique and sensitivity curves of these isotopes.

Iridium proved to be the most promising flaw detecting medium for a range between ½" and 1¾". Others had shorter steel thickness range, less sensitivity, or much longer exposure times. The short half-life of iridium was offset by comparative simplicity of shielding. Design of portable exposure container is discussed.

Weld Flaw Evaluation

S. T. Carpenter and R. F. Linsenmeyer, Swarthmore College, for Bureau of Ships, U. S. Navy. July, 1958 121 pages. Order PB 161322 from OTS, U. S. Department of Commerce, Washington 25, D. C. $2.75.

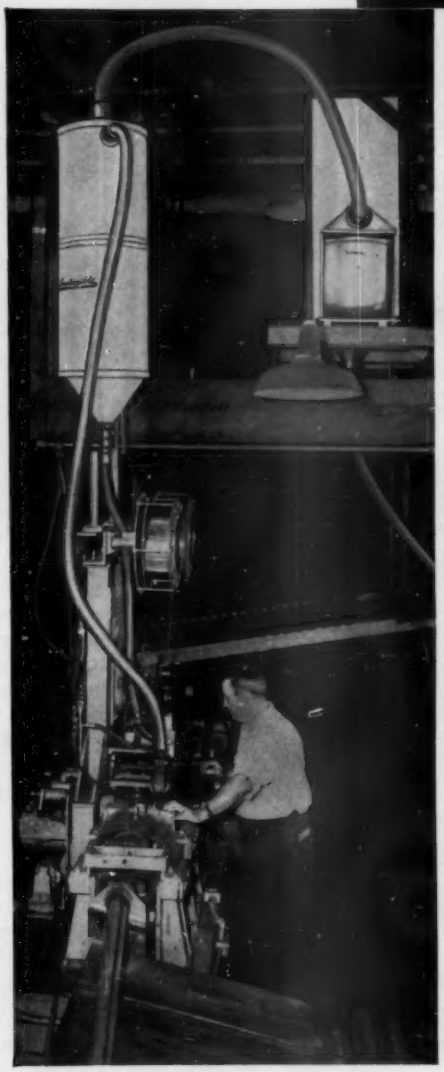
This Navy research report investigated the mechanics of brittle fracture at different temperatures. It was done by simulated flaws in selected materials. The theory was based on the work of A. A. Griffith and G. R. Irwin. Environmental factors causing brittle fracture while static stresses remained low were investigated. Static tests were run on flawed butt-welds and weld flaws in a controlled field of high residual stress. Both static and dynamic tests were made on small butt-weld flaws, with or without residual stress.

Low temperature generally proved to be an essential factor in fractures, but not when dynamic or previously-incurred residual stress were absent. Local residual and reaction stresses appeared to be the most significant factor.

turn to page 52 for a listing of Useful Literature that is currently available

Savings in reclaimed flux alone have paid for Invincible units in a few months, or even weeks, on submerged arc welding jobs.

INVINCIBLE
Welding Flux Recovery Systems
MAKE 3-WAY SAVINGS



Operating continuously, this Invincible recovers all unfused flux from pipe-seam welding operation at a leading automotive firm.

1 *Valuable Flux Reclaimed. Automatic* Invincibles recover *all* unfused flux and return slag-free, dust-free usable flux to the welder—*all in one continuous operation.*

2 *Costly Man-Hours Saved.* Invincibles do the complete job automatically—far more swiftly and efficiently than manual methods.

3 *Fewer Expensive Rejects.* Invincibles remove all fine dust (flux flour), thus reducing welding rejects and speeding production.

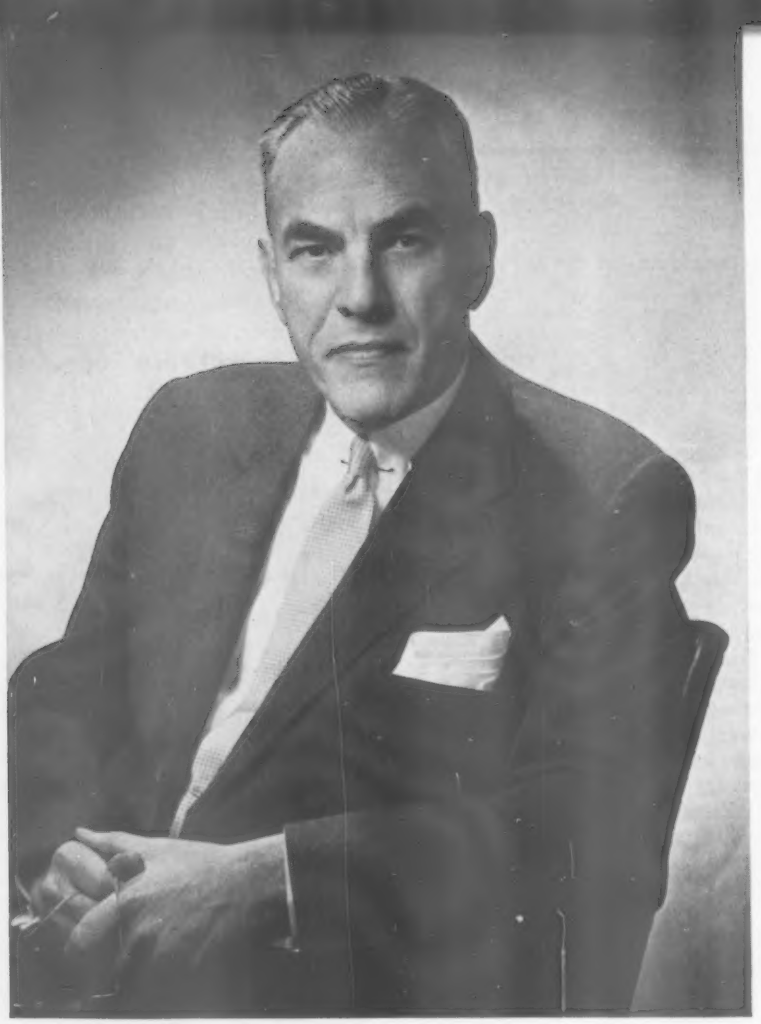
Many Important Advantages

- Ruggedly built to resist abrasive nature of flux.
- Compact and lightweight. Variety of models and flexibility eliminate need for tailor-made installations.
- Portable units also available.

WRITE TODAY FOR FOLDER on Invincible Flux Recovery Systems.

INVINCIBLE VACUUM CLEANER MFG. CO.
DOVER, OHIO

For More Information Circle No. 36 on Reader Service Card.



IRVING B. HEXTER
1897-1960
founder, The Industrial Publishing Corporation

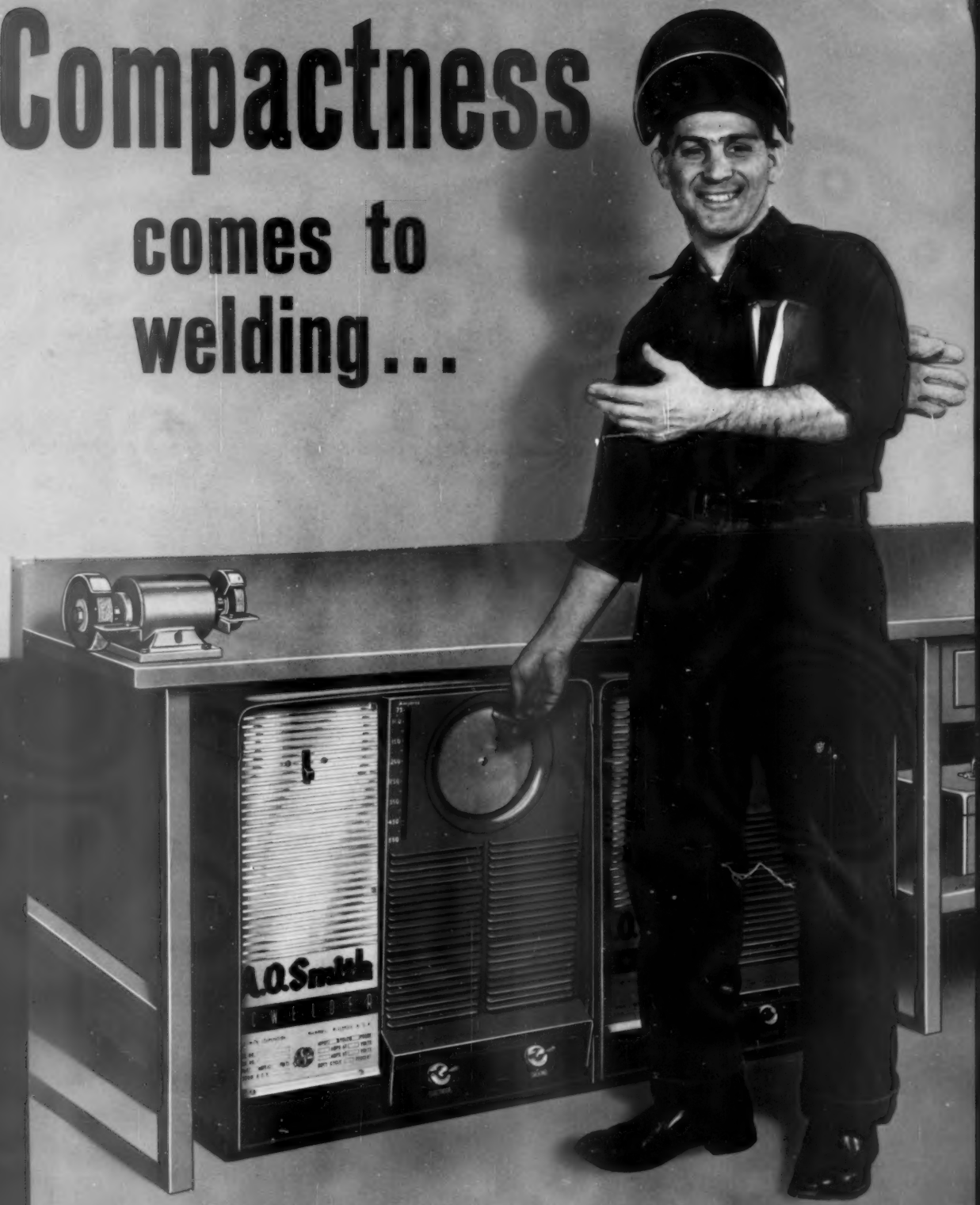
ONCE YOU MET Irving Hexter, you remembered him. He didn't leave neutral impressions. He probably was never neutral about anything in his life. He reacted strongly to things, responded warmly to people—and they to him. He devoted nearly as much effort to people as he did to the publishing firm he founded. Scores of worthy causes asked his help. None was ever refused. His great labor of love was the American Heart Association. He served it as a national officer for years, was the third layman ever to win its Gold Heart Award. He established and endowed a laboratory for heart disease research.

Spending time with Irving Hexter was exhilarating. He had energy enough for five men and it was infectious. He generated ideas at a furious pace; his energy sparked the men around him. You worked a bit harder than your best for him, not because he drove you, but because you couldn't do less and face him. He could spot a phony or stuffed shirt a mile away. He abhorred them.

Irving Hexter traveled 35 weeks a year, with Mrs. Hexter had seen nearly every part of the globe. Living out of a suitcase was his kind of relaxation. He could out-work, out-travel, out-enjoy-living any man in the company. With fierce energy he started a little magazine (that is today WELDING DESIGN & FABRICATION) at the bottom of the depression, built it into a major publishing firm with 13 publications. Then, he assured its permanence by divesting himself of ownership and, more recently, day-to-day management. Not that he slowed down. Irving Hexter had only one speed: forward, high. He was researching another new publication idea when his heart failed. He died May 22 at 62, just a few months before the 30th anniversary of the company he founded.

Circle No. 56 on Reader Service Card. ⟶

Compactness comes to welding...



A. O. Smith's new MONARC line compacks more machine in a smaller package at a smaller price

400 AMP model shown—all models same size.

Compactness comes to welding...

Customized accessories available including D.C. conversion

A. O. Smith's new MONARC line trims the waste from welding machines

No waste of space!

It stacks! It racks! It slides under a bench with the greatest of ease. Only 28 inches low . . . 24 inches wide . . . 30 inches deep—the **MonArc** fits where others take up valuable floor space. You release area for increased production — an important factor with industrial space cost averaging $10 a square foot. We achieved this compact design without compromising superior welding characteristics of the moving-coil machine by making coil movement lateral.

No waste of motion!

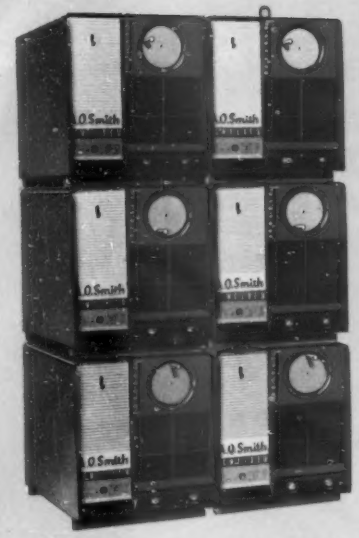
We made time and motion studies. We learned how to achieve compactness with no sacrifice in operational ease. For example, while the **MonArc** is a *foot lower* than conventional machines, the full-range, stepless current-control wheel is at convenient arm's length—higher than competitive models. We also cut down handwheel turns to 15 — fewer turns and easier turning than with any other standard characteristic welder in the market.

No waste of money!

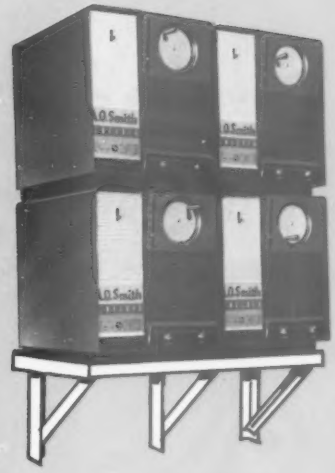
Superior in design. At an economical price, no other machine gives you so much for your money. But while you get more, you never get more than you want. The **MonArc** line consists of three basic machines (300, 400, 500 amp models). We customize this basic line with a selection of tailored accessories. You check off exactly what you need — no built-in "excessories" that add only cost to your operation.

No waste of time!

Our customized approach also saves on delivery time. You don't have to wait two or three weeks for delivery of a certain model from our home factory. Basic machines and customized accessories are stocked in warehouse centers and distributor houses enabling us to meet your requirements exactly . . . and meet them quickly.



It stacks up to three high!



It racks!

It slides under a bench!

SEE HOW IT STACKS UP! The new **MonArc** line is on display at A. O. Smith welding equipment distributors everywhere.

SPECIFICATIONS

Series No.	Rated amperes at 40 volts	Input kw	Duty cycle	Primary amperes with PF correction		Primary amperes without PF correction		Power Factor*		Open-circuit volts	Welding range	Weight in pounds	Height	Width	Length
				230 volts	460 volts	230 volts	460 volts	without capacitor	with capacitor						
300 L	300	12	60%	100	50	108	54	65.4%	79%	80	60-430	363	28"	24"	30"
400 L	400	16	60%	124	62	140	70	65%	84.5%	80	75-550	400	28"	24"	30"
500 L	500	20	60%	158	79	174	87	66.7%	84.2%	80	90-670	415	28"	24"	30"

*Power factor is the average value which includes the benefits of the power factor capacitors when not welding (based on 60% duty cycle).

Because welding fabrication is our full-time business, A. O. Smith maintains the industry's most comprehensive research and development facilities. That's why we can offer you America's finest machines, accessories and electrodes. And when you call your man from A. O. Smith, you'll find that he's more than just a salesman. He's a welding specialist fully qualified to help with your welding problems.

Through research . . . a better way

A.O.Smith
CORPORATION
WELDING PRODUCTS DIVISION
Milwaukee 1, Wisconsin
A. O. Smith INTERNATIONAL S.A., Milwaukee 1, Wis., U.S.A.

MW-263

LITHO IN U.S.A.

Highlights Of N. W. S. A. Convention

CHICAGO: An enthusiastic crowd of 755 members, wives and guests acclaimed the 16th annual Convention of the National Welding Supply Association held at the Palmer House here on May 5-7.

On Thursday afternoon, May 5th, President A. C. Axtell officially opened the Convention. Following remarks by the Executive Secretary and the President's annual address, H. B. Sharer, sales training specialist, United States Rubber Co., addressed the meeting on "How to Put More Sell In Your Selling."

BUSINESS SESSIONS

The business session on Friday morning, May 6th, included talks by W. Robert Flannery, Harris Calorific Sales, Inc., Cranford, N. J.; J. F. Roscoe, executive vice-president, Lincoln Electric Co., Cleveland, Ohio; Howard B. Cary, director, Hobart Brothers Technical School, Troy, Ohio; Roy B. McCauley, chairman, Welding Engineering Department, Ohio State University, Columbus; and Ed J. Hegarty, author and lecturer, Mansfield, Ohio.

The final business session held on Saturday morning, May 7th, featured Les A. Thayer, general sales manager, Belden Mfg. Co., Chicago, who posed the question "Why Do Your Customers Buy From You?" and Dr. Kenneth McFarland, educational consultant, Topeka, Kansas, whose interesting topic was "Who Will Succeed In The 60's?".

CONTACT BOOTH PROGRAM

The annual contact booth program was held on Friday afternoon, May 6th. More than 100 manufacturers had contact booth space and more than 250 distributors attended.

ELECTION OF OFFICERS

V. B. Anderson, V. B. Anderson Co., Santa Ana, California, was elected president of the N.W.S.A. Mr. Anderson has been active in Association's affairs for several years. During the past year he was executive vice-president and national membership chairman. Mr. Anderson's company also operates a branch at Anaheim, California; he is also a partner in the Anderson Equipment Co., which distributes welding supplies and equipment in Los Angeles and Whittier, California.

ANDERSON

Named executive vice president was W. P. McLendon of Keenan Welding Supplies Co., Albany, Georgia.

Six vice presidents were elected. They are: T. Barrett Quinn, Harvey Company of Greensburg, Greensburg, Pa.; Reid Jones, Jr., Jones Welding Supplies, Roanoke, Va.; Leon Bush, Genesee Welding Supply, Inc., Flint, Michigan; Perry E. Johnson, Hohenschild Welders Supply Co., Inc., Kansas City, Missouri; Charles E. Squibb, Welders Supply, Inc., Dallas; and L. J. Paddock, L. J. Paddock Co., Los Nietos, California.

Directors elected for terms expiring in 1963 were: R. B. Cave, Dakota Welding Supply Co., Watertown, S. D.; H. Grady Lester, Jr., General Welding Supply Co., Tampa, Florida; Frank E. Mosely, Crescent Welding Supply, Inc., Gretna, La.; and Robert E. Thornton, Charter Welding Supply, Inc., North Brunswick, N. J.

Norton Opens Plant During Anniversary Celebration

WORCESTER, MASS: The Norton Company's new $6-million plant for making organic-bonded grinding wheels was opened here in May as part of a two-week celebration of the company's 75th anniversary.

The plant, which covers about 225,000 square feet, includes new automatic machines and features. Among these are automatic weighing and delivery equipment, a turret hydraulic press for molding grinding wheels, and continuous ovens to cure organic bonds.

Mixing and molding areas are air-conditioned. The temperature is held between 68° and 78°F. Humidity is held between 35 and 45 grains of water per pound of dry air.

In conjunction with the anniversary, Norton has introduced a new line of abrasive wheels made of 75 Alundum for stainless steel.

The company makes 200,000 varieties of cutting and grinding wheels. It keeps 20,000 types in stock.

Welding industry mourns the passing of R. D. Thomas, founder of Arcos Corp.

PHILADELPHIA: Royal D. Thomas, chairman of the board of the Arcos Corporation, died of a heart attack on Saturday, May 28, in Tokyo while he and his wife were on a tour of the Far East.

Born in Syracuse in 1882 and raised in Pittsburgh, Mr. Thomas graduated in 1906 from Cornell with a degree in electrical engineering. He moved to Philadelphia in 1915 where he worked for the Bell Telephone Co. Shortly after World War I, he began his own business as R. D. Thomas & Co., selling arc welding equipment and supplies.

In 1928 he was made vice-president and general manager of Arcos, Inc., which he merged with R. D. Thomas & Co. to form Arcos Corporation. Until 1957 he served as chairman of the board. Under his leadership, Arcos became a leading manufacturer of stainless and low alloy arc welding electrodes.

Mr. Thomas helped found the American Welding Society in 1919. Since then he has been active in the Philadelphia Section and in the national group. At the Society's annual meeting last April, he was made an honorary member at the same time his son, R. David Thomas, Jr., now president of Arcos Corporation, was installed as AWS president.

Mr. Thomas was a member of the Engineers Club of Philadelphia. He had also served as chairman of the Arc Welding Section of the National Electric Manufacturers Association.

ROYAL D. THOMAS
chairman of the board
Arcos Corporation

For 27 Years Preferred By Welders

THE DURO "STANDARD"

- All Parts quickly replaced with a screwdriver
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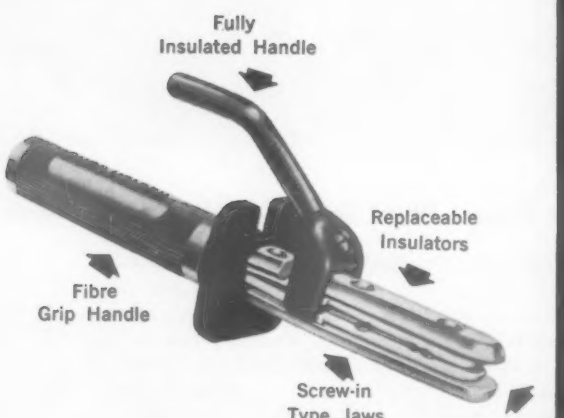
Featuring "Long Jaw design" for reaching those "hard to get at places".



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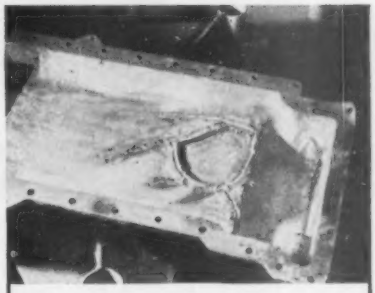
31 OREGON AVE. · HAMDEN, CONN.

For More Information Circle No. 15 on Reader Service Card.

NEVER SAY "CAN'T WELD IT"... Case in point: Midwest shop was given a broken cast iron oil sump to repair. Conventional weld attempts failed due to oil and crack-sensitivity. Porosity and voids resulted. Then they called in Eutectic. Our man-on-the-spot prescribed the cure: our trouble-shooting trio of ChamferTrode®, EutecTrode® 27, and QuenchTrode* 24. Watch them!

1. Weldor vees out area with ChamferTrode, and makes grooves in side of vee to relieve stress.



2. Now he "paints" over entire vee surface with EutecTrode 27, filling grooves as he goes. EutecTrode 27 bonds to the oiliest surface, gives base for joining.

3. Final step: weldor makes joint with QuenchTrode 24, using stringer passes and cold-to-hot back-step method. He quenches with wet rag after each pass, till complete fill is made.

RESULT: A strong, permanent, machinable weld, in a fraction of the usual time. No distortion, stress, or cracking. NOTE: the "Quench Weld" process is equally effective for building up missing metal sections or joining steel to cast iron. This is but one example of how Eutectic helps you.

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My title .....

*Patent Pending ® Reg. T.M. Eutectic Welding Alloys Corp.

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EUTECTIC WELDING ALLOYS CORPORATION

For More Information Circle No. 18 on Reader Service Card.

WELDING MANAGEMENT

watches these developments

WHAT IS RUSSIA'S attitude toward welding? That country's seven-year plan clearly points to an all-out drive to develop welding and mechanization on an unprecedented scale. It is a limitless budget policy, according to the British Welding Research Association, which has been translating Russian technical journals. For example, this is what the Russians themselves write:

"The wide adoption of these methods (submerged arc, resistance, electro-slag, and gas shielded arc welding) is to be the basis on which mechanization of welding processes in our national economy will be quadrupled between 1958 and 1965.

"Our country leads the rest of Europe in the use of mechanized welding methods, and we have outstripped the U.S.A. in the employment of submerged arc and electro-slag welding."

WELDING FRIENDS are international friends. Meeting again at the American Welding Society Show in Los Angeles in April were John Coyne of Coyne Cylinder Co. and R. L. Swan, director and general manager of Lincoln Electric Co., Ltd., England. Only last year, Mr. Coyne and his wife met Mr. Swan and his wife at Kettner's Restaurant—in London, England.

QUARTERLY BUSINESS CONDITIONS reported for the first quarter of 1960 by 190 members of the National Welding Supply Association are as follows.

N.W.S.A. zones	1	2	3	4	5	6	Gen. avg.
Sales – first quarter, 1960 compared to first quarter, 1959 – %	+18	+10	+13	+6	+4	+10	+11
Number reporting	42	20	41	33	19	35	190

Zones are as follows: No. 1, Eastern; No. 2, Southeastern; No. 3, Central; No. 4, West Central; No. 5, Southwestern; No. 6, Western.

A LEASING PLAN has been announced by United Specialties, Inc., manufacturers of *Weld-Reel* and *Reel-King* automatically retractible hose and cable reels. Leasing periods run from one to five years. Full information on the lease arrangement is available from United Specialties, Inc., at P. O. Box 698, El Dorado, Ark.

EDITOR'S NOTE: *Confiscatory taxes, particularly inheritance taxes, are a special problem for owners (majority stockholders) of closed corporations. Upon the death of the owner, his estate in many cases must liquidate the business in order to pay these confiscatory inheritance taxes.*

Niels C. Miller, president and founder of the Miller Electric Manufacturing Company explains the problem in the statement below.

We are printing this statement because this same problem faces welding equipment manufacturers, welding supply distributors, and welding fabricators—many of whom are the majority stockholders of a closed corporation.

"WHEN YOU READ in the paper that some communistic country or some country controlled by a dictator has confiscated people's property, you hear the expression: 'Thank the Lord I Live in America—it can't happen here.'

NIELS C. MILLER

"Confiscation of property is happening in these United States. Just like leprosy or cancer, it is slowly but surely destroying our resources and our wealth. This confiscation of property is done by unfair, immoral, and unconstitutional excessive misapplication of taxation.

"My property is being confiscated by such taxation. Let me explain.

"A little over 30 years ago, I started a small company that came to be known as Miller Electric Manufacturing Company. I ran this business alone for several years. Then I decided to incorporate because there was more prestige and confidence in the corporate form of doing business.

"As it is well known, we had little capital. We had, however, energy, good health, confidence, and enthusiasm, and each year we built a successfully larger corporation.

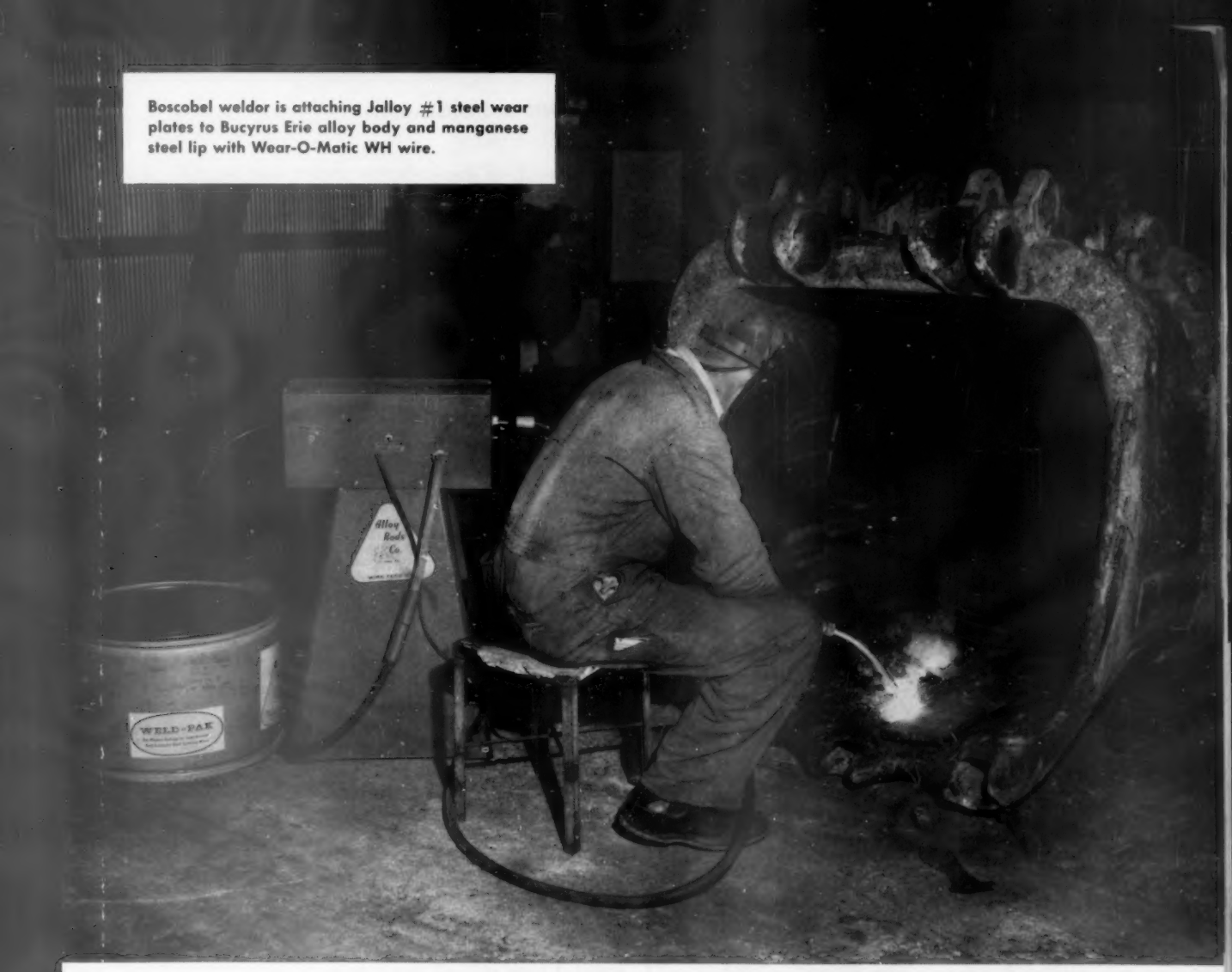
"We paid no dividends because we used dividend money for working capital. Consequently, we did not have to borrow. Our records will prove that we have paid the Federal and State Tax Bureaus about 59 percent of our profits as taxes year after year. There was taxation on property already taxed simply because we owned it.

"Being a large majority stockholder, I believed I was building a business I could consider my own and that I was personally paying taxes on its income year after year.

"I had to pay a high rate on earnings of the company I owned. The money held by the corporation as dividends was taxed. As soon as I received the dividends, they were again taxed. The combined total of

continued on page 24

Circle No. 3 on Reader Service Card.——→



Boscobel weldor is attaching Jalloy #1 steel wear plates to Bucyrus Erie alloy body and manganese steel lip with Wear-O-Matic WH wire.

35% Savings on bucket maintenance with NEW Wear-O-Matic WH welding wires

"Wear-O-Matic WH is the most versatile welding wire for bucket maintenance because it provides high strength welds in any of the popular alloy steels and has excellent resistance to impact when used for build-up work. Savings in time and labor through the semi-automatic open arc application of this wire have resulted in less bucket down time and lower costs."

L. ARDEN HENLEY, SUPT.
BOSCOBEL GRANITE CORP., MANAKIN, VA.

WHAT about bucket maintenance in your shops? Costs too high due to too many manual welding applications? The important benefit gained by Boscobel Granite was the elimination of manual welding with stainless steel electrodes to obtain the necessary high strength attachment welds for their rugged rock handling chores. These benefits can be yours whether you are welding manganese to manganese, manganese to carbon steel or either of these to any of the abrasion or impact resistance alloy steels. Then, without changing wires, your weldor can apply build-up deposits to lesser worn areas such as latch pins, keepers and lips . . . a deposit that will work harden to outwear manganese steel. To put more service life in the business end of your shovels and drag lines, investigate today the semi-automatic open arc application of Wear-O-Matic WH wires. You'll lower your maintenance costs . . . decrease down time and increase working life. For complete details, request Bulletin AR-21. Alloy Rods Company, P. O. Box 1828, York 1, Pa.

ALLOY RODS COMPANY

YORK, PENNSYLVANIA

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WELDING MANAGEMENT

continued from page 22

tax rates on the dividends was greater than the dividends. In other words, this property was confiscated by the tax bureaus.

"After several years of this type of alleged legal robbery of property, I made a heart breaking discovery. I could not let my family carry on my business because of the confiscatory inheritance taxes that would be involved. My family could not have enough money to pay the inheritance taxes. This meant my business would have to be liquidated to satisfy the selfish bureaucrats who have wasted billions of dollars of tax money.

"Consequently, I started to go around to some of the best tax experts in the country to find a way to solve our problem. Their answer was always the same —'Well, Mr. Miller, you are so right. This is confiscation of your property by the government bureaus, but at the moment, it is considered legal.'

"I have been determined to set up some kind of liquid fund to help my heirs pay the inheritance taxes so that my business can continue. However, the confiscatory nature of the taxes involved prevents me from doing so.

"I could sell this corporation and pay a capital gains tax, which would still leave me enough to be in a fairly good financial position. But this would not solve the problem. It would not contribute anything toward destroying this evil confiscation of property through unconstitutional taxation. We have worked too long and too hard to give in to the bureaucrats.

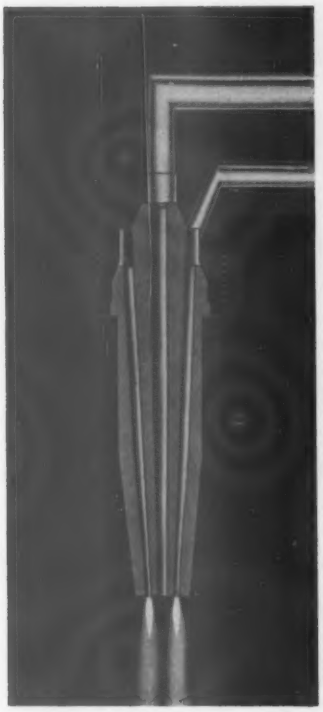
"There is a possible solution that warrants consideration. This means fighting the bureaucrats in court in attempting to put an end to confiscation of property by taxation. I am willing to sacrifice my time and money and jeopardize the rest of my future. But I need your support and encouragement to the fullest extent. I hope you will give it to me.

"One of the first and important things to do is to eliminate the double taxation on dividends, or at least consider dividends as something other than straight income. The least that could be done would be to permit the few stockholders in a closed corporation to receive dividends and treat them the same as capital gains for tax purposes because actually dividends are capital gains.

"It is hard to believe that in the United States of America, confiscation of property by taxation was ever intended to occur by those senators and representatives who originated our tax laws. I honestly believe the present senators and representatives can and would be willing to clear up the situation of double taxation on closed corporations. However, It must be brought to their close attention.

"I am writing this article because I feel so strongly about maintaining the company I have built, and I know that many of my friends are in a similar situation. If we had a concerted action by injured people like myself, I am sure we can get the reputation of the United States of America back where it belongs.

"I will appreciate your help, and if you concur with me and write to your congressman, I will appreciate a copy of your letter."



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Compared to other remedies, hardsurfacing with job-tailored P&H electrodes is dirt cheap. You get high-speed, high-deposit welds that cut equipment downtime from days to hours. In most cases, you don't even have to take the part off the machine. Your welder can do it alone — and right on the spot.

Keep your equipment on the job by welding worn and broken parts with tailor-made P&H Hardsurfacing Electrodes. Write for Bulletin R-27.

324

For repairing worn shafts

For hardsurfacing Muller tires

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JULY, 1960

Welding Design & Fabrication

ESTABLISHED IN 1930 AS INDUSTRY & WELDING

SPECIAL REPORT

on small parts . . .

or mammoth ones, there are . . .

New Horizons For Hardsurfacing

HARDSURFACING saves millions of dollars every year. It can literally save billions, once machine builders and users are aware of the tremendous strides that have been made in developing new hardsurfacing alloys, equipment, and techniques. For example, research teams are discovering almost daily alloys that can withstand just about any service conditions. In fact, some of these alloys actually gain resistance with increased use.

These alloys take many forms: wire, rods, coated electrodes, tubular wire and electrodes, pastes, powders, hardening compounds, bars, plates, repointers, grouser bars, castings, and assorted shapes and forms. But, all of them are intended to give economical use where resistance is needed against wear, impact, abrasion, corrosion, heat, or any combination of these factors.

More and more specialized hardsurfacing alloys are becoming available. Job conditions, like impact, abrasion, corrosion, and heat, make standardization of alloys difficult. How then does the user know which one to select for his application? The best basis for selection is past experience—of the users and alloy manufacturers. Between them, they select two or three alloys that seem to fit the application best and field test them. Finally, they vary the application of the alloy proven best. The result: the most economical, longer-lasting deposit.

turn the page to learn how industry leaders rate hardsurfacing today, what to look for tomorrow

Hardsurfacing saved industry $100,000,000 this year . . .

5 KEY QUESTIONS . . . 5 STRAIGHTFORWARD ANSWERS . . .

We asked industry leaders for answers to five key questions so that we might give you a sort of "state of the industry" report on hardsurfacing. The questions were tough. Hardsurfacing has mushroomed in the last few years. And there are no up-to-date figures to show where it stands today.

We expected—and got—opinions and estimates based on the business experience of each leader. Naturally, the answers varied, but there was essential agreement on every point. Also the questions mirrored that part of the hardsurfacing business in which the expert was engaged. In general, the smaller the segment, the smaller the estimate of business size and growth potential. For example: Those companies specializing in materials for a single industry didn't see dollar volume as high as a company supplying materials to all industries.

The answers were straightforward. They were optimistic. They showed that hardsurfacing is good for both supplier and user, that it's big business, and that it will soon get much, much bigger. All of the leaders agreed that their major job, besides research and development, is education. Equipment owners and manufacturers have to be shown the need of hardsurfacing, if they don't already know it, and be introduced to new applications and developments, if they do. They agreed that education had to be a continuing thing, if more original equipment parts and more worn parts are to be hardsurfaced.

Here are the answers the industry leaders gave. The answers aren't individual estimates; they're composite statements of ten experts. Use them as a yardstick of the importance of hardsurfacing, then look around your plant to see what's to be done.

1 How Big Is The Industry?

We sold between $10- and $50-million worth of hard-surfacing materials during the past year. The majority (5) think that the true figure is $30 million. Two contend that $22 million is closer. One thinks it's a conservative $10 million.

It boils down to this: no matter how conservative or how optimistic our estimates, hardsurfacing is a healthy and fast-growing fledgling. It's pretty obvious that there's a real need for our alloys and equipment. Over a billion dollars are wasted yearly for want of protective overlays. Spots of the right materials in the right places can stop this waste.

Why the 40 million dollar spread in our answers, you ask? Perfectly normal, we say. Naturally, each of us talks about the business he knows best—his own. Some of us supply hardsurfacing alloys to a single industry—maybe construction, mining, or quarrying. Others get into industries across the board; have a wider range of alloys and forms. Thus, the marketing data on which we base our estimates differs.

Don't hold us to the dollar, but when the dust clears and the figures are published, we think it will be mighty close to our average—$31 million.

2 How Much Will It Grow In The Next Ten Years?

Predicting the growth of hardsurfacing in ten years is almost like asking: "Who's going to win the pennant in 1970?" For that matter, even the experts can't tell who the pennant winner will be this year. Fortunately, there are fewer variables in the hardsurfacing industry than there are in a ball team. For one, we don't depend on the performance of a certain shortstop; our performance in development and education is cumulative. Everything we learn can be used to provide better alloys, easier welding, to better resist wear, corrosion, heat, and loading.

Our predictions for the growth of hardsurfacing during the next ten years range from cautious ones to extremely optimistic ones—from 10 percent all the way to a whopping 500 percent. Most of us (4) agree that the industry will double in size in ten years. Three say it will increase 10 to 30 percent. One (and we hope he's right) proclaims that growth will reach 500 percent. Another said that the growth would at least parallel the growth of industry as a whole.

Who's right?

In a sense, we're all right. The use of hardsurfacing is bound to increase. How much depends on the business climate during this period and how well we educate users. The difference in our estimates, again, is due to our individual business experience, and how much of the hardsurfacing pie we slice.

Let's temper optimism with a little caution. If we're right, hardsurfacing business ought to more than double its present size in ten years. Our estimate (the average) is a 230 percent increase. Now, using $31 million as the size of today's hardsurfacing market and multiplying it by the estimated growth, you end up with 71.3 million. Check this in 1970.

and it's only the beginning

BY THESE INDUSTRY LEADERS

E. R. Walsh, III, vice-president, sales
Alloy Rods Company

W. M. Barron, assistant sales manager
American Manganese Steel Div., American Brake Shoe

George Munson, general sales manager
Coast Metals, Inc.

E. C. Hurt, sales manager, welding rod sales
Haynes Stellite Company, Div. of Union Carbide Corp.

W. Scott Fitz, Jr., marketing specialist
Kennametal, Inc.

Phil Welty, sales manager
Rankin Manufacturing Co.

Carl F. Smith, president
Rexarc Incorporated

Ralph S. Thompson, advertising manager
Stoody Company

L. W. Stettner, president
Victor Equipment Company

W. P. Clark, president
Wall Colmonoy Corporation

3 How Much Does Hardsurfacing Save Industry Every Year?

Knowing that industry spends $31 million a year for hardsurfacing materials, how much does it save with this investment? Across the board, industry saves at least three times the cost of the hardsurfacing materials it uses, or between $90 and $100 million a year.

Another point to consider: There are countless original equipment parts protected by hardsurfacing. When you consider that the service life of a protected part is 2 to 5 times that of an unprotected part, the savings will be in the same proportion to the value of the original equipment. The same applies to worn parts reclaimed by hardsurfacing.

4 Which Industries Use Hardsurfacing The Most?

Our electrode, wire, rod, plate, casting, shape, powder, paste business comes from every industry. Hardsurfacing is a prominent part of maintenance in every one. It's being used more and more on original equipment parts to make them longer lasting, thus more attractive to prospective buyers.

These industries are our best users: Construction, petroleum, mining, quarrying, rock crushing. We pretty well agree that they are listed in the order of their importance. The steel industry is beginning to use hardsurfacing in a big way too. They hardsurface blastfurnace bells and hoppers automatically with tons of alloy. And there's a lot of other equipment around steel mills that require protection against heat, corrosion, and wear.

Let's break down alloy usage by type. The largest users of nonferrous alloys are the valve and pump manufacturers. This figures. Close tolerance sealing surfaces on pump and valve parts have to stay hard even when hot and resist corrosion and erosion. And who uses the most ferrous alloys? Construction, mining, agriculture, and cement industries. The largest user of tungsten carbide hardsurfacing is the oil industry. Oil men depend on tungsten carbide to keep drills going in dirt, rock, and shale.

5 What Are The Trends In Hardsurfacing?

Unquestionably hardsurfacing will follow the lead of the welding industry in general: faster, easier application of more effective alloys. In other words, more semiautomatic and automatic welding. The aim, of course, is to reduce labor costs as service requirements increase.

We're all working on stronger, more abrasion-resistant deposits made with manual and automatic processes. We know that there will always be a place for manual hardsurfacing; there are many applications where it's the most economical way.

But the biggest developments are toward automation.

Another trend: more and more original equipment is being hardsurfaced. With it, manufacturers don't have to heat treat expensive alloys to get good service life; they can use run-of-the-mill carbon steels and often get better part life.

We are developing better alloys and better ways to put them on. And we hope eventually we'll have standards that make alloy selection easier—without the drawbacks of today's standards. As we become smarter in this business, so does the user. He investigates our alloys more carefully before deciding on one. He doesn't fall into the old trap: you pay less if you buy the cheapest alloy. He's found it's more important (and cheaper) to buy the alloy that will hold up best in service.

turn page to see how industry is using, and saving with, hardsurfacing

...Hardsurfacing At Work *in construction, pipelines,*

1 Semiautomatic gas hardsurfacing of gate valve seals is economical; base metal is 0.30 carbon steel.

2 Two welding heads and eight spindles triple roller hardsurfacing speed.

1 Globe And Gate Valves
Ohio Injector Company
Wadsworth, Ohio

The insides of big gate and globe valves made by The Ohio Injector Company have a lot to do with performance and manufacturing cost. Thanks to hard surfacing, the cost is right and the performance is outstanding.

Most important of the inside parts are seats and wedges. They effect the seal in the valve and, as a result, are the parts most vulnerable to wear and damage. They are cast in low cost 0.30 carbon steel, then their seats are hardsurfaced. The overlay resists oxidation, seizure and galling, and stays hard even when hot. Without hardsurfacing, the seats would soon leak. To make the parts of more resistant metal would raise the cost unduly.

The Ohio Injector Company is sold on hardsurfacing. It's sensible to put expensive alloys only where they are needed. And OIC is looking for more and more uses for hardsurfacing—on stainless, Monel, brass, as well as steel. The company hardsurfaces in two ways: semiautomatic gas welding and semiautomatic submerged-arc welding. The service demanded of the valve determine which one it uses.

For gas welding, it uses the Haynes Stellite No. 6 type of alloy rod, a cobalt-base material, in 3/16 and 1/4-inch diameters. The work turns on a variable-speed table used flat for rings or with a tilted, false top for wedges. The filler rod feeds by gravity. As it feeds, it oscillates, by means of a motor drive, to overlay the full width of the seat.

Large parts are preheated to welding temperature with three multi-tip oxyacetylene torches. Smaller parts are preheated in a nearby furnace, then kept hot with a single welding torch. The torches are water-cooled; they wouldn't last if they weren't.

Operator skill and dry gas are prerequisites to perfect overlays. OIC's operator feathers the reducing flames just so and when the metal is up to heat, welds. The results are beautiful. The overlay is smooth and uniform.

Immediately after hardsurfacing, the part is slow-cooled in powdered lime. Later, the seat will be machine ground and the part assembled in a valve.

2 Tractor Rollers
Ohio Machinery Company
Cleveland, Ohio

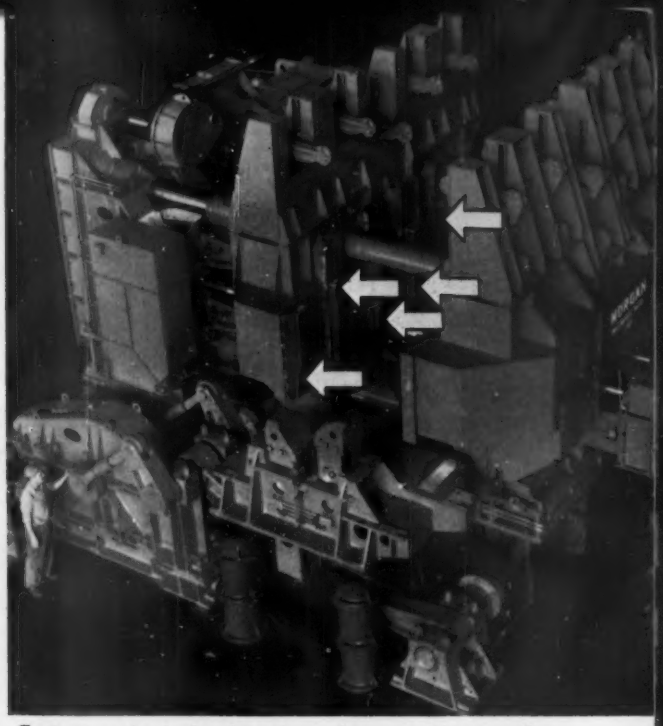
Tractor parts—rollers, idlers, sprockets, and tracks—are probably the best-known hardsurfacing applications. And it's no wonder. They churn all day through dirt, mud, stone, rock—all abrasive, some capable of impact and shock.

Tractor parts last, or they don't, depending on what they work in; how fast the machine is run; and how the track is set. If vulnerable parts wear too much the owner can expect to pay about a fifth the cost of his tractor for new parts. Fortunately, there's a much cheaper way, if he doesn't wait too long: Hardsurfacing.

Omco's business is Caterpillar tractors; selling new ones, keeping old ones in pay dirt. It has five plants in Ohio; three have the latest hardsurfacing equipment. And business is good. The curve's rising and there's no letup in sight.

The fastest wearing, most rebuilt item on a tractor are the rollers. There are 6 or 7 on each side of a big machine. Omco helps Cat owners guard against

3 Compressor piston rod, worth $2,000 new, is metallized with high-chrome stainless for only $90.



4 Fourteen hardsurfaced anvils on beam straightener will resist extreme pressures, scale, and dirt.

too much part wear by giving them a gauge. It shows him when he must rebuild, or pay through the nose if he waits.

Omco hardsurfaces rollers in sets. First, they pull the shafts, then measure wear. They steam, then weld. They weld rollers on an eight-spindle semiautomatic welder with two submerged arc heads. The operator fuses one pass of work-hardening metal on the worn areas, then indexes the jig to the next roller. It takes three to five passes to rebuild rollers. And the pass-at-a-time procedure keeps them from overheating. The finished overlay is remarkably smooth; and the roller is ready to get back into the traces.

Rebuilt rollers last at least as long as factory-fresh, induction-hardened ones—and they're a lot cheaper.

3 Pipeline And Compressor Parts

Natural Gas Pipeline Co. of America
Fritch, Texas

Another form of hardsurfacing is metallizing. Metallizing does two important jobs for Natural Gas Pipeline: It reclaims expensive compressor parts, and it corrosion-proofs manifold piping.

The largest compressor parts metallized are power piston rods. They're 13 feet long and 7⅛ inches in diameter. There are 60 of these rods used in the station's 15 compressors. Each one costs about $2,000 new; metallizing makes worn ones like new for $90.

First, the rods are rough threaded in a lathe. Then they are metallized with a high-chrome, high-carbon stainless steel. The coating is machined, then ground to 0.065 inches.

The company uses the same gun, a Metco 4E wire gun, to corrosion-proof the 6- to 24-inch manifold pipe. Until ten years ago the pipe was painted. But the paint flaked and the pipe had to be repainted every two years. A contributing factor was that the pipe got as hot as 350 F.

With metallizing—first a thin coat of zinc, then a top coat of aluminum—manifold piping has never been retreated. It's still as good as new.

4 Beam Straightening Press

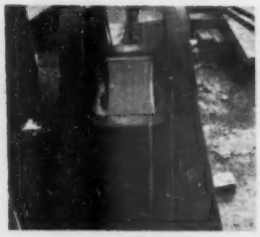
Morgan Engineering Company
Alliance, Ohio

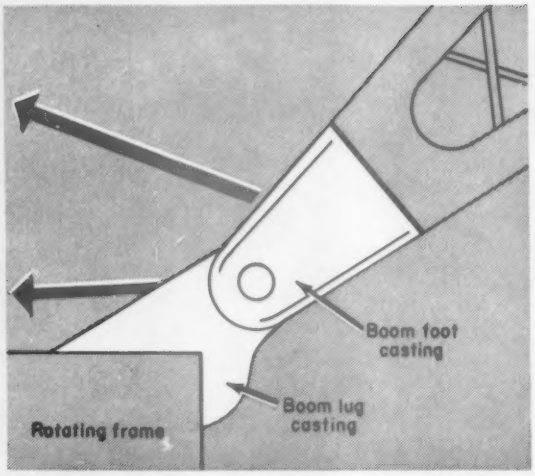
Rolling mills have one more operation after they roll big I-beams—straightening. To do this, Morgan Engineering Co. builds gigantic gag presses that will straighten 36-inch wide-flange I-beams that weigh 300 lb. per foot, and 14-inch H-beams that weigh 426 lb. per foot. The squeeze on a 36 incher tops 2-million pounds. And now there's a gag press on the boards that will even top this.

All this power straightens the work through removable anvils—seven on each of the two, 16-foot long jaws. Anvils are 2½-feet wide, 4-feet long, 4-inches thick, and hardsurfaced. The ¼-inch hard layer won't upset, wear, or mark for a long time. Dirt and scale hardly faze it. If it weren't for hardsurfacing, anvil marks would mar the beams and the mill would have to rework them.

The last anvils Morgan Engineering Co. made were manually hardsurfaced with coated tube electrodes. On the next job they'll use semiautomatic, open-arc welding and high-manganese, high-chrome wire containing moly and nickel. This will provide two advantages: fewer cracks in the deposits; faster surfacing.

continued on next page





5 Hardsurfaced areas of boom foot and boom lug castings (in red) will take a 1.5 million-pound load. That's the load of the boom and dipper on the socket shown circled in photo, page 31.

6 Powder hardening is quick: first heat the part, coat it, then quench it in water.

5 Socket For Mammoth Shovel

Marion Power Shovel Company
Marion, Ohio

How are these for design requirements?: Socket joints in extreme compression combined with metal-to-metal frictional wear. There's not much impact, but the load on each socket is 1.5 million pounds. Then there's a vibratory load of unknown proportions.

Impressive, aren't they? These are the destructive forces at work at the ends of a gigantic boom on the 70-cu.-yd. stripping shovel built by Marion Power Shovel Company. Deadweight of the boom is 300,000 lb. and who knows what the dipper and dipper handle weigh, and how much more is added when the dipper if full of coal or overburden.

Two socket joints are hardsurfaced. Each consists of a boom-foot lug—a 12,500-lb. casting welded to the front girder section of the big shovel's rotating frame, and a boom foot—a 3,900-lb. casting welded to the ends of the T-1 steel boom. Pins through feet and lugs keep the boom from pulling out when it swings.

Socket castings are normalized and drawn. A typical composition is 0.20 carbon, 0.70 manganese, 1.50 nickel, and 0.08 vanadium.

Boom-foot castings are machined, hardsurfaced, and ground with a shaft-mounted grinder. Then with heavy fillets, they are welded to the boom. Lugs are hardsurfaced after they are assembled and welded to the rotating frame. Then they are ground by hand until the contour fits a template.

It takes about 200 lb. of electrodes to overlay the affected surfaces of feet and lugs. It takes two or three layers to get the 5/16-inch thick pads—enough for finishing to ¼-inch thickness. The composition of the crosswise beads is 0.60 carbon, 0.145 manganese, 0.80 silicon, and 2.75 chrome. The deposit contains few crosschecks and has a hardness of Rockwell C 50. Marion gets full hardness by neither preheating or postheating.

6 Casting Machinery Parts

James B. Clow Company
Coshocton, Ohio

In hardsurfacing, you usually add metal to a part to protect it from heat, corrosion, or wear. But there is another kind of hardsurfacing that adds no metal. It isn't even a welding process, but it's hardsurfacing nevertheless. This method hardens a surface by diffusing elements into it with heat. These carburizing, nitriding, and chromizing elements are contained in a powder into which parts are dipped after being heated.

The big advantage of this process: low-cost, low-carbon steel parts get long-wearing cases, making them just as lasting as high-cost steels. Also, high carbon parts won't crack due to decarburization if given the powder hardening treatment.

The James B. Clow Company casts 375 tons of 3- to 16-inch pipe and fittings every day. The work is hot and heavy, and it's hard on certain parts of their machinery. Examples: The ladle-support pins of the casting machines, and the front shields of pneumatic hammers.

Every pipe Clow makes has casting fins. Fins, by the way, are films formed when molten metal squirts between mold parts and solidifies. Clow gets rid of fins with pneumatic hammers. A tubular hand-hold shield on the hammer takes repeated blows from the tool collar. Untreated shields would soon peen over and be worthless. This Clow avoids by hardening them with Hard-N-Tuff compound. The shields are 5-inch long, 1¼-inch O.D., 3/16-inch-wall tubing.

Hardening is quick and easy. Clow furnace-heats the shield to 2,100F., then plunges it into Hard-N-Tuff powder. The only thing they have to be careful about is to have the adhering powder cover the part. Bare spots will be soft spots. Immediately the part is reheated. This process is repeated twice to gain full hardening depth (1/32"). After the final reheat it is quenched in water and it's ready to use. • •

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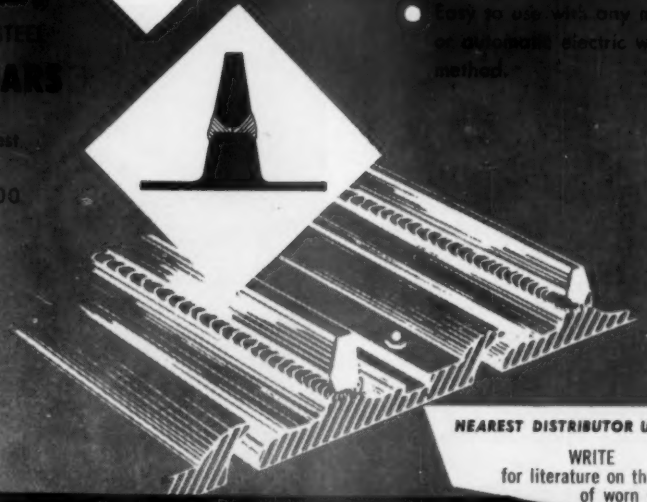

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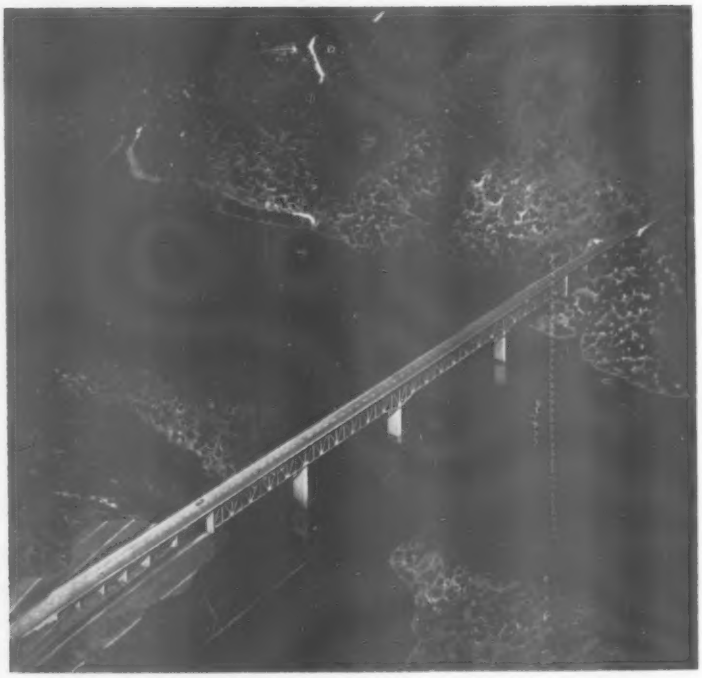
CARQUINEZ BRIDGE was built with bolted field connection from three different grades of welded high-strength steels. This use of welded alloy steels cut $800,000 from the cost of the superstructure.

FEATHER RIVER BRIDGE was built from a combination of alloy steels. It carries a railroad on the lower deck and a highway on the upper. This means the truss design was governed by railroad requirements (bolting and riveting) while the welding of main members was confined to the highway parts of the structure.



Structural designers and engineers are using more and more of the high-strength steels because they are tough, ductile—and weldable.

WELDED BRIDGES

New Horizons For High-Strength Steels

by A. L. ELLIOTT, *bridge engineer, State of California*

IN BRIEF: Without welding it would be impossible to utilize the advantages and economies of high-strength steels.

IT TOOK CENTURIES to work up from cast iron through wrought iron, then through ordinary A7 carbon steel into the high-strength steels. Now, in the last 25 years, we have been progressing at an unheard of rate. These are the reasons:

First, steels used in structures today have higher strength than ever. Their yield points range from the old A7 yield point (33,000 psi) to three times that amount. Metallurgists are speaking confidently about steels with yield points five times higher than A7 steel.

Second, these steels are being joined by welding. This combination makes it possible to use to the full all the advantages and economies of the lighter, stronger high-strength steels.

DESIGN BACKGROUND

High strength steels cost more than ordinary A7 structural steels. The designer can't waste steel in splices and lap joints. He specifies welding plates edge-to-edge to make box and plate girders without flange angles, splice plates and thousands of rivets. This is a real savings.

More important, welding gives the designer an entirely new system of design into which high-strength steel fits admirably.

Let me tell you a few things we have done with high-strength steels in California.

In 1935 the steel companies brought out their alloy steels in structural shapes. California started using them soon after. In 1939, the State designed two large truss bridges containing over 2,200 tons of this new steel. Two years later this steel was covered by ASTM tentative specification as "A242 Alloy Steel." Since then, thousands of tons of this alloy steel have been used in California highway structures. Well over 100,000 tons of A242 Steel have been used in the last 10 years in welded structures alone.

SAVE $800,000 ON CARQUINEZ BRIDGE

When the early designs for the second Carquinez Straits Bridge were beginning to take shape in 1953, there had been no extensive use of the new 90,000-psi yield strength steel in any application. The weight saving and the smaller members which this steel would make possible were very attractive to the designer. Over 3,000 pounds of the new steel were tested, welded, broken and torn in the State Highway Laboratory to discover its vital characteristics. Finally, in 1954, we decided to fabricate a substantial part of the bridge from the new steel.

The new bridge is a double cantilever with two 1,100-foot main spans. It closely parallels a 1927 bridge and was given the same general overall lines and spans. Welded construction and bolted field connections give it clean lines and trim members.

Heavily stressed members are T-1 steel, intermediate members are A242 and lightly stressed members are A373 steel. The total tonnage is 2,910 tons of T-1, 5,370 tons of A242 and 6,440 tons of A373. We figure that these alloy steels cut $800,000 from the cost of the superstructure.

FEATHER RIVER BRIDGE

Another large bridge using a combination of alloy steels is the West Branch of the Feather River Bridge in Northern California. It carries a railroad on the lower deck and a highway on the upper. This means the truss design was governed by railroad requirements. They call for riveted or bolted connections throughout. The welding of main members was confined to the highway parts of the structure. The use of high-strength steel was limited to A242. Although this bridge is mainly riveted and bolted, it illustrates the combining of A7 to A242 steel to save weight and reduce the size of members.

BENICIA-MARTINEZ BRIDGE

The Benicia-Martinez Bridge is now being constructed across the Carquinez Straits about four miles above the Carquinez Bridge. Like Carquinez, it is all-welded with bolted field connections. It makes the most of the best qualities of all three grades of steel.

High strength steel is used in the most highly stressed member. It was also used in the joints to greatest strength with the least weight and bulk. The use of a high strength material made it possible to carry economically a uniform depth of truss clear across the bridge without deepening over the piers.

WHISKEY CREEK BRIDGE

An interesting use of welded high-strength steel can be found in the Whiskey Creek Bridge now being built in northern California. A dam now under construction will flood out US 299 just west of Redding. The new road, high on a mountain side, crosses a deep canyon at Whiskey Creek.

A 3-span welded-steel-plate girder has been designed for this location. The two end spans are 260 feet. The center span is 350 feet, including a suspended span of 260 feet. The web plate is maintained at a constant depth of 144 inches throughout the length of the bridge. To maintain this constant depth, three different stress grades of steel were used. T-1 is used in the web and flanges in the most highly stressed sections. This is graduated down to A242 in the areas of intermediate stress. And, A373 is used in the areas where the stress is least.

Except for 90 feet in the middle of the long span—where two-inch material was used—the flanges are a constant 1-¾ inches thick clear across the bridge. Where this change was made to two inches, the additional thickness was taken on the outside to make the weld between flange and web continuously straight.

There are many advantages to this arrangement. First, these is a savings in gross weight because welded high-strength steel was used. Fabrication is simpler and appearance better. And, high-strength steel is economical: The strength of the steel rises at a faster rate than its price, so you get more for your money.

OTHER ADVANTAGES

Sometimes high-strength steel makes possible certain types of fabrication not possible with ordinary A7 steel. For example, it would have been impossible to have used welded A7 steel trusses on the Carquinez Bridge. The plate was so thick it would have been exceedingly difficult to make welded connections. And, the Whiskey Creek girders would have had to been much deeper and of variable depth if A7 steel had been used. • •

BENICIA-MARTINEZ BRIDGE is all-welded with bolted field connections. Using a high-strength steel made it possible to economically carry a uniform depth of truss clear across the bridge without deepening over the piers.

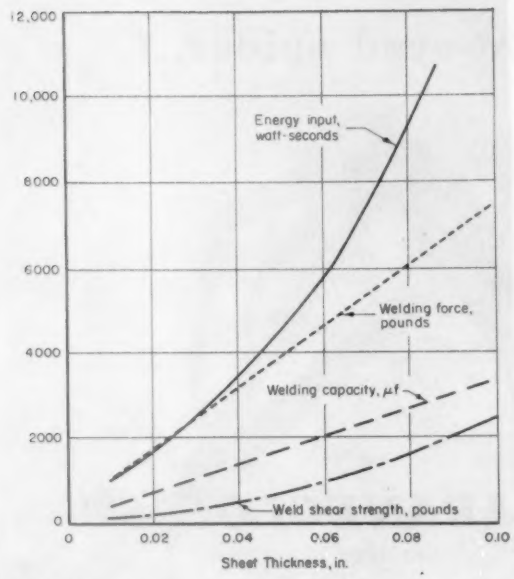


FIGURE 1: Conditions used for spot welding molybdenum and results obtained.

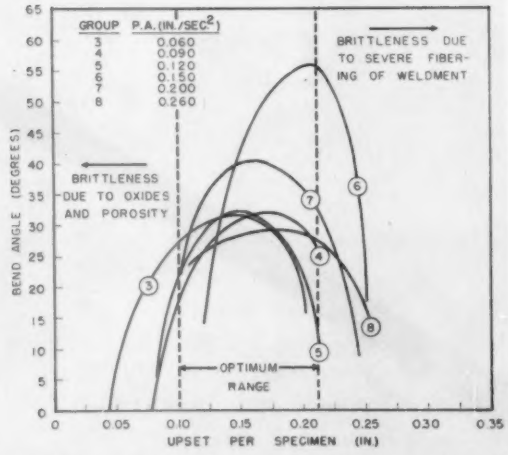


FIGURE 2: Effect of upsetting conditions on bend angle of arc-cast molybdenum flash welds made in air.

This metal is strong at elevated temperatures and has high elasticity. That's why it's being used more and more in jet-age applications

Part 3 of 3

How To Weld Molybdenum

MOLYBDENUM HAS BEEN resistance welded longer than it has been arc welded. Spot and seam welding have been used almost entirely in the electronic tube and lamp industries on thin sheet, small diameter wire, and small parts.

Figure 1 shows the conditions used for capacitor-discharge welding of molybdenum sheet. The weld pressures and powers are somewhat higher than for other materials. And, the weld strengths are lower.

This weakness is probably due to the brittleness of the welds. This brittleness is as much a problem in spot and seam welds as it is in arc welds. This low strength has not bothered people making tubes and lamps, because they have not depended on the welds for structural strength.

The brittleness is caused by the same things that cause it in arc welds: recrystallization and oxygen. It is prevented the same way. Use base materials with a low oxygen content. And, protect them from contamination by oxygen during welding.

Spot and seam welding is often done under a liquid, such as carbon tetrachloride, to protect against contamination by air.

Molybdenum parts are often spot or seam welded with dissimilar metal inserts, such as tantalum and nickel foils. These are actually brazed joints since usually only the insert melts.

The big problem in both spot and seam welding of molybdenum is poor electrode life. This is caused by the electrode sticking during welding. Some work has been done to prevent sticking by using different electrode materials, including tungsten tips. However, they stick just as much as copper.

This sticking is probably caused by the high heat conductivity of molybdenum and the low surface resistance between the faying surfaces of the parts being welded. Projection welding can often help overcome this problem. Etching the sheet before welding also helps. Using insert foils can also reduce the sticking problem.

Some work has been done on flash welding molybdenum, but again, the welds are brittle. Experimental work shows that shielding the parts from air does not help much. Perhaps the quality of the base metal affects the brittleness. The results of this work are summarized in Figure 2.

In flash welding remember to keep the platen acceleration as high as possible during welding. And, hold the upset in a critical range to suit the size and shape of the parts being welded. This range was from 0.10 to 0.21 inches in the rods in Figure 2. Current needed to flash weld molybdenum is two to three times that needed for mild steel. • •

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For welders who prefer to weld in a very lightweight jacket. Seams are double thread sewed. Snap fasteners down front. Snap fasteners on each sleeve for snug fit (nickel plated for heat reflection). Pocket also has snap fastener for security.

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Eddy Current Testing Of Superalloy Weldments

IN BRIEF: Breakthrough in weld inspection is expected to help develop new techniques for fabricating the difficult-to-weld superalloys.

SUPERALLOY WELDMENTS must perform without failure at 1650 F and higher in military and space airframes and engine systems. These, currently, are the prime uses for these superalloys.

Satisfactory weld inspection has been one of the big problems in fabricating these superalloys because most of them are difficult to weld. Rene 41, for instance, is apt to crack.

A major advance in inspection methods seems to be a new process under development. It uses the eddy current for testing welds. This accurate, new method of weld inspection may lead to better welding because it will enable users to study and develop new, and better welding techniques. The eddy current equipment can scan 60 feet a minute. It can locate surface and subsurface defects.

Weld inspection specifications for superalloys now call for penetrant testing to find surface defects. X-ray inspection is used to find subsurface irregularities, although it has some critical limitations. The information revealed by X-ray does not justify the cost involved in terms of the man-hours needed to inspect welds in airframes and missiles.

Research investigation using the eddy current test has located all the defects found by fluorescent or dye pentrant tests and X-ray inspection. And it has found some that neither located.

At first, the process will probably be used along with X-ray and penetrants. They'll be dropped gradually as new inspection standards are established. Then eddy current inspection can almost completely replace the other two processes. X-ray inspection will be reserved for spot checks and pictures of defects.

The prototype was developed by Henry Ridder, application engineer for Magnaflux. Development was accelerated by Ridder and his staff through modification of basic off-the-shelf instrumention.

Search probes will be needed for each specific job application. Manual search probes have been used in the test program, but production-line versions will be automatic.

"The probe must stay exactly on the weld for accurate readings on the superalloys," Ridder explains. "This cannot be done with a hand probe on large weldments".

Ridder also revealed that the test showed they had to use an electronic lift-off adjustment. "Without it",

EDDY CURRENT INSPECTION

This testing method is based on magnetic induction in which a magnetic field induces eddy currents within the material being tested. (An eddy current is an induced electric current circulating wholly within a mass of metal.)

The magnitude and phase difference of these currents is, in turn, reflected in the actual impedance of the pickup coil. Careful measurement of this impedance is the revealing factor in detecting defects.

Instruments are available to do the job on a fully automatic basis. Parts may drop or pass through a coil, or a probe-coil may be moved over the surface of a part. In either case, the basic principle is inducing eddy currents in the parts and detecting the effect of these currents on a measuring coil or probe.

THE SUPERALLOYS

This broad classification includes the iron-nickel, nickel-base and cobalt-base alloys. Addition of nickel to the iron alloys has resulted in the development of a series of austenitic precipitation-hardening alloys. These contain from 25 percent nickel (iron-base, A-286) to 55 percent nickel (nickel-base, Rene 41).

EDDY CURRENT INSPECTION equipment is used by Henry Ridder, who developed it, to detect defects in a Rene 41 weldment. Deflection of needle records a defect which is marked with a grease pencil.

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he said, "weld roughness could be interpreted as a defect. But, the lift-off will compensate for the variation of the air gap between the probe and the weld."

"One by-product of our work on the inspection probe," says Ridder, "is the discovery that the probe can locate a weld in a very smooth surface. We can accurately measure the width of the weld zone."

Ridder cautions that inspectors will have to stay within the weld zone when they use the probe. "Readings outside the zone," he says, "are entirely different from those within."

The eddy current test does these things:

Readings are instantaneous, appear directly on the instrument. When the weld is satisfactory, the needle barely moves. The needle deflects sharply when the probe passes over a defect.

Human error can be prevented by automation. The system can include mechanical and electronic attachments and a pen recorder for easier interpretation.

Inspection is speedy and inexpensive. There is no electronic limitation. "The only limitation," declares Ridder, "is the speed of the pen recorder."

Developed specifically for the superalloys, the test can inspect materials no thicker than 0.050 inch. This is the depth eddy current will penetrate. However, by probing both sides, a piece up to 0.100 inch thick can be inspected.

Another limitation is that the test does not tell the inspector what kind of defect he has found. However, this may not be an important limitation for materials such as Rene 41 because applications where these alloys are used can tolerate no defects of any kind. • •

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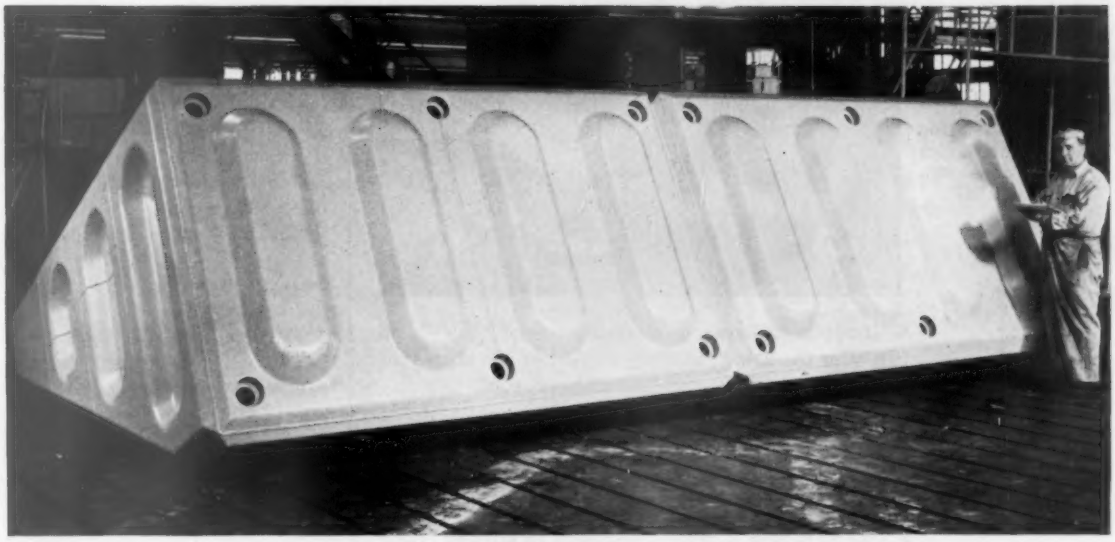
ASSEMBLY: Cable pipes simplify the assembly of pontoon panels and strengthen the pontoon when it's finished. Rough edges are broken with a disc sander as a safety precaution.



FINISHED PRODUCTS can be threaded together with cables in practically any combination. Their lines are clean and functional.

New All-Welded Pontoon Is Stronger, Lighter, Cheaper

IN BRIEF: Baldwin-Lima-Hamilton builds tremendously useful pontoons that ship knocked down and nested for waterside assembly and welding.

EVER THINK of building your own pontoon? The Army, Navy, dock, and salvage people did. Now Baldwin-Lima-Hamilton makes a kit for them. The kit ships flat from Philadelphia, winds up an unusual and tremendously useful piece of equipment.

You already knew that pontoons are boyant, watertight structures, used to hold things up in the water, or to float a bridge. The traditional pontoon is a cylinder that resists control. It rolls and bobs in the water.

B-L-H's pontoon is different. It's designed to keep an even keel and to lie as quietly as the water will allow. It's a rectangular structure of welded steel, about 10 feet by 20 feet by 6 feet deep as it sits in the water. You make a barge, a bridge, or a pier, simply by threading a number together with cables through pipes. A row of six pontoons connected with cable makes a 20- by 60-foot barge shaped like a boat and just as seaworthy. By tightening the cables with a jack, the barge or bridge acts as a unit, not six separate pieces, each on a cruise of its own.

The first pontoons were shaped like they are today but constructed differently. They had flat side plates stiffened with welded angles. They were effective pontoons, but too heavy and too costly.

Today's pontoons are light and strong because the panel plates are corrugated for stiffness. The corrugations are bathtub-shaped. They are in two sizes, both hot pressed into the 3/8-inch ASTM A-7 steel.

The B-L-H tool engineers were remarkably ingenious in keeping die costs down. With usual tooling, the costs could have easily reached $125,000. They made a set of dies for a fraction of that. The difference

continued on next page

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Without metallizing no maintenance or "job" shop can offer the same complete service as the shop that uses industry's low-cost "putting-on" tool.

With modern, low-cost metallizing equipment you can spray carbon steels, stainless, babbitts, brass, bronze, nickel, aluminum, tin, zinc, special hard facing alloys including tungsten carbide.

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Thousands of large, well-known companies and shops have been metallizing users for many years, not only in maintenance work but in production applications on original equipment. Now, with modern low-cost metallizing equipment this high-speed "putting-on" tool is within the reach of even the smallest shop.

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Telephone: EDGEWOOD 4-1300
In Great Britain: METALLIZING EQUIPMENT COMPANY, LTD.—Cheltham near Woking, England

For More Information Circle No. 45 on Reader Service Card.

was in the making.

Using an electric eye flame-cutting machine to cut 4-foot by 8-foot by 4-inch thick blocks of carbon steel, the operator accurately angled his torch to make the bathtub cut. The dropout was the male half of the die. And the cut was so accurate, the grinding dressup was easily and quickly done. The piercing hole, from which the cut was started, was simply welded up and ground.

The company assembled and welded a few pontoons, but most of them go knocked down. Shipping charges are a lot less that way, because the panels for several pontoons can be nested on skids in less space than finished pontoon would take.

COMBINING PANELS SAVES DIES

The triangular end panels for bow and stern pontoons are made in six pieces. If they weren't, B-L-H would have to pay for two more corrugating die sets. The large panels are made in two-5-foot-wide pieces, each with two corrugations.

They bend the edges of each panel to butt with the edges of the mating panels. This improves the pontoon in three ways: Panels butt instead of lap —fitup is easier, looks better. There are no naturally weak corners. Without sharp corners, neighboring pontoons are less likely to be damaged.

To make the panels, flat plane joints are welded with automatic submerged arc. Where the joint dips into a corrugation, across corners, in out-of-position places, they use manual welding. Panel edges require no preparation for welding beyond shearing. A pass is run on each side of the joint for full strength.

CABLE PIPES ADD STRENGTH

Cable pipes are designed into the B-L-H pontoons and add much to their value. There are six cable pipes inside each pontoon. They are placed for most effective lashing; they make it easier to assemble the pontoon; and they certainly add strength. The pipes have a collar welded to each end. The collars fit cutouts in the panels.

The pontoons also have a bolted hatch. It's down in a corrugation, out of the way. An operator can get inside the pontoon, either to make closure welds, or to repair leaks.

Another detail the company watches: they mask the parts for painting. This eliminates field welding through paint. • •

the fringe pattern tells the story in . . .

New technique for stress analysis

FRINGE PATTERN drawn in by our artists, is actually multicolored in PhotoStress. Color shows the magnitude of strain; black shows the directions of principal strains.

IN BRIEF: The latest wrinkle in stress analysis is finding important application in testing solid fuel rocket cases. It can be interpreted quickly and quantitatively to show how parts can take it.

THERE'S A NEW WAY to test the stress behavior of critical parts. It's called PhotoStress, a development of Tatnall Measuring Systems Company, Phoenixville, Pa., a Budd Company division.

Budd's Defense Division is using PhotoStress to study the stresses in their solid fuel rocket motor cases, actually welded pressure vessels. They are made of Allegheny Ludlum's AM-355 alloy, a precipitation hardening stainless steel. This is an alloy for aircraft and missile parts which must be very strong yet very light. Budd gets the alloy's full strength in motor cases because they have it cold rolled after heat treatment.

PhotoStress works much the same as the photoelastic method of studying stresses. Instead of stressing a plastic model to simulate stress patterns, the part is coated with the plastic, stressed, then photographed with special lenses and polarized light. PhotoStress changes color to reveal applied stress. It translates strain levels into contrasting colors, which can be interpreted quickly and quantitatively in terms of stress, load, pressure, torque or force.

When even the slightest strain is applied, the plastic deforms. The deformation creates two sets of fringes. Fringes, by the way, are lines of constant shear stress. The color fringe shows the magnitude of the strain; the black fringe the directions of the principal strains. • •

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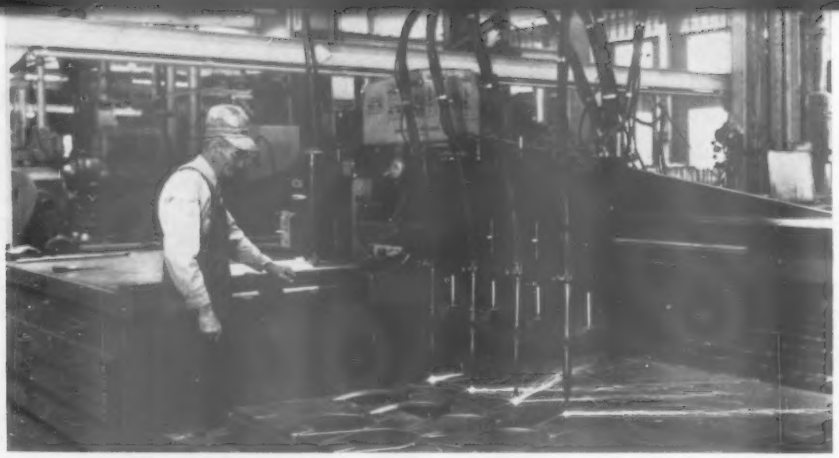
the equipment . . .



FOUR TORCHES cut parts to 1/32-inch tolerance. They are guided by an automatic electronic tracer which works from a single pencil-line drawing.

the results . . .

A VARIETY of sizes and shapes are economically cut for parts used in oil field pumping units (extreme left). Expensive plywood-base, aluminum strip edge templates (left) have been replaced by easily stored paper templates.

Automatic Flame Cutting Saves $10,000

By **JESS KERN**, *plant manager, Parkersburg Rig & Reel Co., Coffeyville, Kansas*

IN BRIEF: Automatic shape cutter reduces labor costs, increases machine efficiency, and lowers template costs.

WE REPLACED four single-torch flame cutting machines with an automatic, electronically-controlled multiple-torch shape cutter. The new machine saves us over $10,000 a year. It reduced labor costs, increased machine efficiency, and lowered our template costs.

The automatic machine we bought was made by National Cylinder Gas, Division of Chemetron Corp. It controls torch motion through an electronic tracer that follows a paper-and-pencil drawing. We no longer need the templates we had used. The tracer consists of an electronic scanner, a drive unit, and a control panel. The scanning cam follows the center of a drawn line (0.040-inch or less in width) at speeds up to 25 ipm.

LESS LABOR AND MORE EFFICIENCY

Four men operated our four old flame cutting machines. Today, we need only two men—one a shift— to run the automatic. These two men turn out more work because each of the four torches on the new machine is 15 percent faster than the single torches on the old machines.

TEMPLATES COSTS 80 PERCENT LESS

Template costs have been reduced $640 a month. One man used to work fulltime making plywood-base templates with aluminum strip edges. Now, one draftsman spends less than half his time making about 25 paper templates a month. He just draws them full size in pencil on plain white paper. Our template costs now are $160 a month. About $40 of this is the cost of converting old templates into drawings. This cost will disappear once we convert all old templates.

We store the paper templates in a drawer under the machine. They take little space and are readily available. We used to store the large bulky plywood templates outside the production area. This meant the operator had to get a truck operator to bring templates to the machine. It sometimes took hours to get a single template. • •

Are you paying

5 TO 10 TIMES TOO MUCH FOR WELD INSPECTION

. . . . and not finding ***ALL*** *the cracks?*

If you are testing to routine specifications—or applying such specs—it is quite likely that you are paying an unnecessary high price. Certainly it is a possibility worth investigating!

With Magnaflux testing . . .

you can reliably inspect about 150 feet of linear welds per hour, at a cost of approximately 4.4¢ per foot of weld. This includes man-hour cost for two inspectors working at an *average* rate, plus the small cost of Magnaflux powder used.

For non-linear welds, your cost will be about 50% more—or roughly 6.6¢ per foot of weld, including normal cost and time for moving scaffolding.

Compare these costs with what you are paying now!

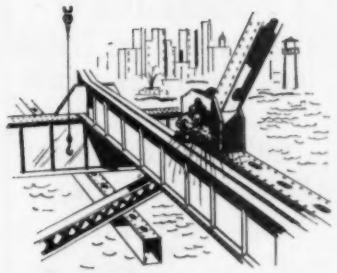
How reliable is Magnaflux?

It is the only recognized test proven completely reliable for finding all cracks open to the surface . . . however small or deep. These are the cracks that raise stresses dangerously and cause most of the failures in weldments.

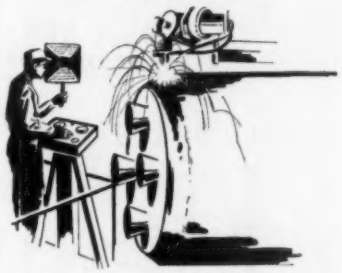
Many manufacturers of X-ray equipment frankly caution that X-ray may not find all these cracks. Yet, these very cracks are most important to find! Nor will *any other method* find them at a cost as low as Magnaflux.

None of this implies that Magnaflux testing eliminates all need for other test methods. Magnaflux *can* cut your testing costs and it *will* find many cracks other methods overlook, and the significant sub-surface defects, as well.

Shouldn't you investigate these savings now? Ask to have a Magnaflux Engineer detail the whole story—soon.

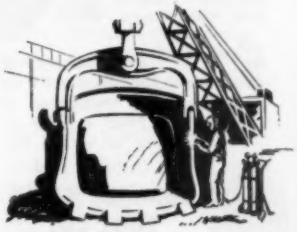


CONSTRUCTION: Bridges, buildings, etc. Magnaflux is proved out on important welds.



SPACECRAFT: Critical welds. Often several Magnaflux and other methods needed—on each weld.

OIL and CHEMICAL: For pipeline, reactor, or tank—welds proved crack-free.



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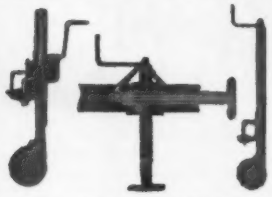
BULL DOG JACKS



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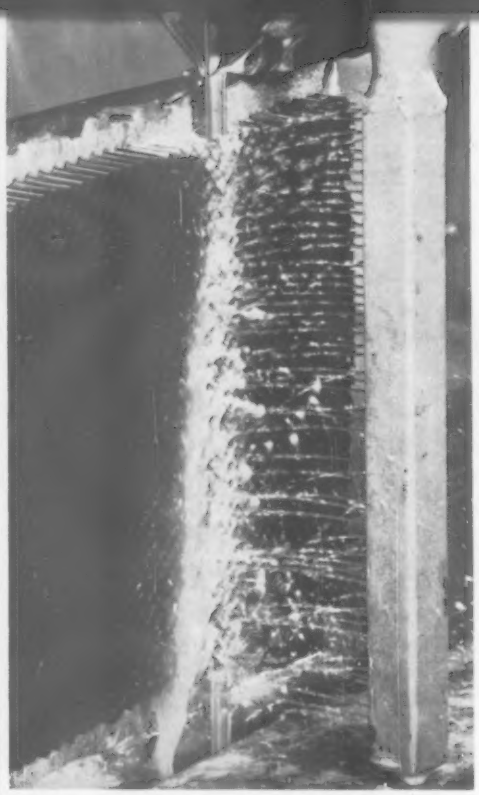


HIGH-SPEED BAND arcs accurately and rapidly through delicate honeycomb core. Since neither band nor work is loaded, fixturing has only to hold the work vertical.

Quenched Arc: A new way to cut

IN BRIEF: This machine accurately cuts through flimsy, thin-metal parts at high speed; it leaves no burr and doesn't harm the metal.

NOW THERE'S A WAY to machine thin, hard-to-support materials and parts, quickly and accurately. It's called "quenched arc cutting," by the developer, DoAll Company of Des Plaines, Illinois.

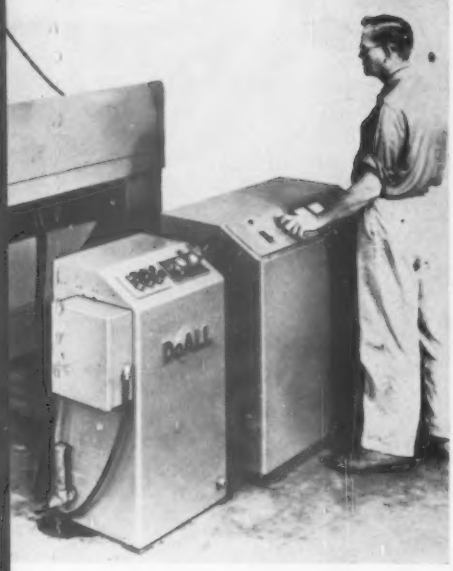
The Electro Band, as it is called, machines fragil, cellular structures, like honeycomb core, in stride along with parts made of thinwall tubing. Honeycomb is the machine's specialty—in aluminum, stainless steel, titanium, and zirconium.

Let's say honeycomb core is to be cut. You feed it into a highspeed band (like a bandsaw blade without teeth) carrying enough low-voltage, high-current power to sustain an arc at the leading edge. Geometry and voltage establish the feed. Coolant quenches the arc, prevents buildup of heat, and metallurgical changes in the metal. The coolant washes away the swarf; the cut is clean and burr-free.

Advantages of the machine: speed, little waste (cut is only 1/32" wide), excellent finish. Honeycomb core can be accurately sliced from a thick slab, like boards from a log, instead of wasting the time and material it would take to grind separate blanks.

The arc cuts, not the band. Neither the work nor the cutting band are stressed. This is in contrast to sawing, grinding, and milling, in which work and tools are highly stressed. There's no load, so the fixtures for quenched arc cutting need only strength enough to hold the work vertical, without sagging.

You might think a blade wouldn't last, arcing as it does. But it does. It's made of inexpensive material, metallurgically balanced to withstand arcing without cracking. It's good for many hours of continuous use. If you want, you can use wire in place of the cutting band.



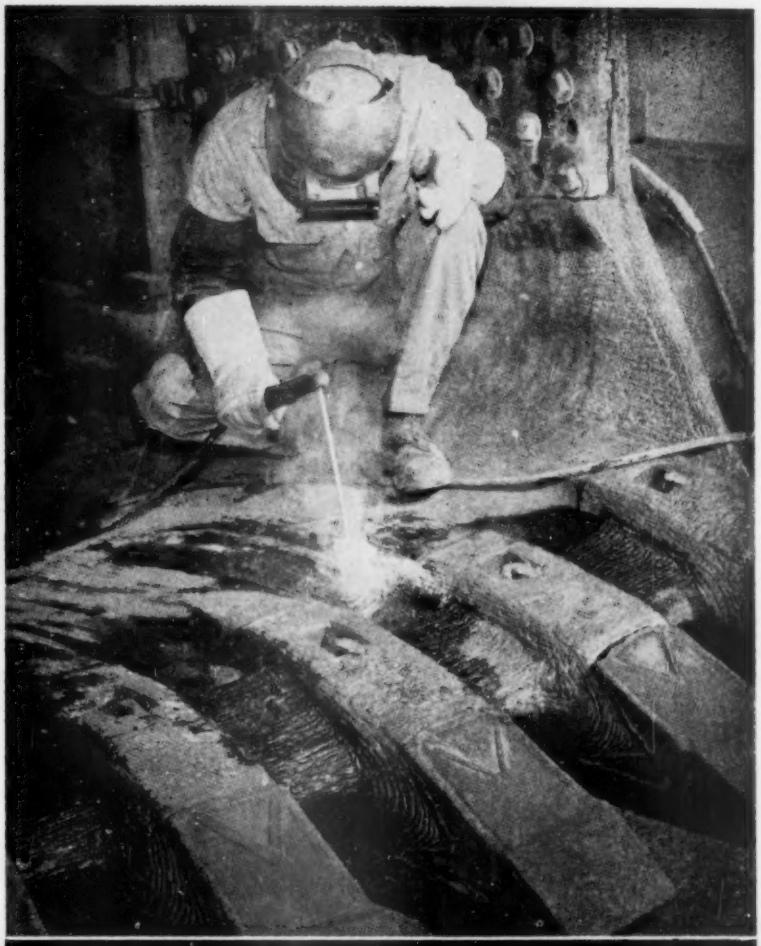
thin-metal parts

Cut smoothness depends on cutting speed in quenched arc cutting. A fine finish (comparable to grinding) can be made at 5 to 50 square inches a minute. Where foil-edge finish isn't fussy, the cutting rate is much higher—150 to 200 square inches a minute.

Surface finish (total indicator reading) ranges from ±0.003 inches at slow cutting speeds to ±1/64 inches at high speed.

The machines come in three sizes. Each has a fixed-speed band unit, power supply, and a recirculating coolant system. Feed rates for the largest machine are 0.03 to 11 fpm.

The smallest machine (16-inch throat, 12-inch work height) was designed for small-part, experimental use. The medium machine (35 ¼-inch throat, 24-inch work height) for slabbing and rough machining of honeycomb, and for sectioning radiator cores and heat exchangers. The big machine (26-inch throat, 48-inch work height) is intended for large, precision cutting. Example: finish machining of honeycomb. • •



NOW, A MANGANESE STEEL ELECTRODE
with High Build-up, Low-spatter, Easy Slag Removal

A special new Amsco rod, Nicro-Mang, for both joining and buildup of manganese steel

Out of Amsco® metallurgical research has come a new welding rod that gives you high weld strength without cracking on Austenitic manganese steel. A rod that lets you lay down a bead without slag popping, and slag removal is easy.

To lick the cracking problem, it took a special alloy of chromium and nickel, plus a unique coating for Nicro-Mang.

Write for Nicro-Mang bulletin, or see your local Amsco distributor.

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For More Information Circle No. 6 on Reader Service Card.

WELDING DISTRIBUTOR'S service engineer and operator examine weld.

COMPLETED WELD.

Welded Repair Of Base Saves $1,084

IN BRIEF: Welded repairs of a cast drill press base costs only $216 and eliminated a long wait for a new one.

A FIVE-TON DRILL PRESS was being unloaded from a semitrailer truck at Prince Manufacturing Co., Sioux City, Iowa. A cable snapped and the press dropped four feet to a concrete loading dock. The press was not damaged. But, a 22-foot crack in the one-inch base made the machine useless.

PROBLEMS

A telephone call to the press manufacturer in Ohio gave the company little encouragement. There was no base in stock. A new one would have to be cast. It would take weeks to make the molds, pour a casting, and machine and deliver the new base. The cost would be $1,300.

The company then called in Howard Stauffer, service engineer for Monroe Welding Supply Co., Sioux City. He thought the base could be repaired by welding. As he saw it, the problem was to use a welding rod that would penetrate the cast iron, yet not set up stresses in the casting.

SOLUTION

Stauffer suggested two electrodes: A non-machineable one as a root and butter pass for strength, then a nickel-cored electrode for good ductility. The second electrode would fill the crack and take a machined finish.

Stauffer recommended for the root pass the #6 non-machineable electrode for cast iron made by All-State Welding Alloys, Co., Inc. He felt it would give a dense, sound, and high strength weld. His second recommendation was All-State's #8 nickel-cored electrode that could be used with a low welding heat (only 125 amps). This would give a machineable deposit and a good color match.

WELDING TECHNIQUES

In welding, Stauffer had to prevent overheating from building up stresses in the casting. This was done by extremely careful welding.

The first pass was skip welded using 1/8-inch rod at 125 amps. This joined the broken casting into a complete base.

The final step was to groove and fill in the remainder of the crack with the nickel-cored electrode to get necessary ductility.

RESULTS

Complete cost for time and materials was $216. This was more than $1,000 cheaper than a new base. And, they didn't have that long wait for a new base. • •

Photo courtesy Caterpillar Tractor Co.

For Speed and Economy in Flame Cutting Using Natural Gas

The use of Harris cutting torches accomplished the most economical balance between cutting speeds and oxygen consumption. Harris torches were selected over competing brands.

This installation permitted performance not otherwise possible and the gas savings are substantial.

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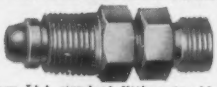
Your Welding Supply Distributor Serves You Best with these products

NEW
INERT-ARC AIR-WATER HOSE & MACHINE ADAPTORS



#403 Righthand

To adapt new IAA standard fittings to old-style torches or machines. #404 and #406 Lefthand units also available.

#405 Righthand

All are two-piece, silver-soldered units with swivel nuts to assure gas-tight seating. Write for Catalog-Price Sheet.

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IN 1936, MORT CLARK, then Vice-President of the world's largest sign manufacturer, wanted a welded galvanized sign frame. Every welder manufacturer said it couldn't be done . . . Mort Clark did it, received a check and certificate of achievement from the Lincoln Welding Foundation—and

MORT CLARK'S GALV-WELD® ALLOY ORIGINAL & GENUINE

WAS BORN

The Navy didn't believe, tested it 3384 hours in salt spray (100 hours is normal), then approved it. Westinghouse reports Galv-Weld roof sign, installed 1936—still perfect in 1959—23 YEARS LATER!

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WHY EXPERIMENT?

Regalvanizes corrosive seams and areas where galvanizing is burned away by welding, skipped in hot dip galvanizing, or abraded in fabrication.

Eliminates corrosion areas produced by welding, so that weld will stand up under paint, WITHOUT rust, as on ornamental iron. Simply use residual heat from welding, or reheat, wire brush, and apply. No fluxing—No fumes.

Makes every welder a galvanizer of small weldments or parts. Repairs chipped porcelain, rusted appliances, rusted auto, truck or trailer bodies, frames, fenders, or other steel products. Can be readily refinished to match surrounding surface.

Ideal for pipe joints, galvanized structures, water and fuel tanks, duct systems, cold storage lockers, sinks, drains, washers, towers, steel buildings, railings, etc.

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REFERENCE DATA *catalogs, handbooks, manuals*

FLUX RECOVERY SYSTEMS and how they can increase the efficiency of submerged arc welding operations is the story told in a folder available from Invincible Vacuum Cleaner Mfg. Co.

Circle No. 36 on Reader Service Card.

HOW REINFORCED-RESINOID depressed-center wheels can give faster and better weld grinding and longer wheel life is explained in Bulletin ESA 244 issued by Simonds Abrasive Co. Featured is Simond's new Series 60 Double XX wheels.

Circle No. 300 on Reader Service Card.

"A HANDY GUIDE to welding cast irons" illustrates the many different repair jobs that can be done with International Nickel Company's Ni-Rod "55" electrode for repairing cast iron. Technical data and helpful welding tips are given.

Circle No. 35 on Reader Service Card.

PROGRAMMED WELDING AUTOMATION with infinitely versatile time-amperage controls is explained in Bulletin W-155 issued by Harnischfeger Corp. Described in detail are tape-programming, automatic spot-gun controls, and motorized rheostats.

Circle No. 301 on Reader Service Card.

GRINDING WHEELS for the welding trade are featured in a new catalog issued by Norton Company. Catalog 1724 with net price supplement is a complete guidebook that tells how to get best results on all grinding jobs.

Circle No. 302 on Reader Service Card.

FOUR REBUILDING MACHINES for renewing track rollers, links, idlers, and crushing rollers are featured in descriptive literature. The machines are made by L & B Welding, Inc., now a wholly-owned subsidiary of Victor Equipment Co.

Circle No. 303 on Reader Service Card.

GAS TRANSPORTS that offer mobility and semi-permanent storage of gases in tubes are featured in Catalog No. 58 from Harrisburg Steel Co., Division of Harsco Corp. The catalog gives complete details on this practical system with capacities up to 100,000 cubic feet and more.

Circle No. 304 on Reader Service Card.

AUTOMATIC WELDING WIRE for submerged arc and inert gas applications are featured in Folder DH-402-C from Page Steel and Wire Division. Descriptions and uses of many analyses are listed. A variety of packaging is described.

Circle No. 305 on Reader Service Card.

A 24-PAGE CATALOG on Tuffaloy resistance welding tips, tip holders and alloys has been issued by Air Reduction Sales Co. This is the first catalog to utilize the new "RSV" taper numbering system for specifying spot welding tip size. Shown for the first time are new holders in straight, offset, close-coupled and universal styles.

Circle No. 306 on Reader Service Card.

FACTS AT YOUR FINGERTIPS: *If you want copies of the catalogs featured on these pages, just circle the appropriate numbers on the bound-in Reader Service Card. We'll do the rest.*

"A COMPLETE GUIDE to selective fluxing for low temperature silver brazing" is the long title for a handy guide to fluxing principles and techniques. It's available from American Platinum & Silver Division, Engelhard Industries, Inc.

Circle No. 307 on Reader Service Card.

DETAILED AND PRACTICAL information on how Anaconda welding rods can be used in repair and production jobs is featured in Publication B-13 issued by American Brass Co.

Circle No. 308 on Reader Service Card.

A FULL LINE of welders is illustrated and described in a 12-page, two-color booklet from Miller Electric Mfg. Co. More than 40 different models are featured.

Circle No. 309 on Reader Service Card.

A HEAVY-DUTY three-way oxy-cutting machine is the subject of literature from Milo Mfg. Co. Working capacities and technical details are given for Model Z-2 which operates from templates, a line drawn on the plate itself, or an automatic circular cutting attachment.

Circle No. 310 on Reader Service Card.

AUTOMATIC REELS for hose and cable are described in a new catalog issued by United Specialties, Inc. Styles and types are shown for single and dual hose and cable applications.

Circle No. 311 on Reader Service Card.

NON-DESTRUCTIVE TESTING equipment available from Philips Electronic Instruments is described and illustrated in a new 12-page booklet. Featured are a variety of units for X-ray inspection and electronic fluoroscopy.

Circle No. 312 on Reader Service Card.

CORRECT FILLER ALLOYS for all recommended wrought alloy parent metal combinations can be found in Alcoa's new Filler Metal Selection Chart. In one easy-to-read table the chart helps make alloy choices based on parent metal combination and common service requirements demanded of welded assemblies.

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For More Information Circle No. 58 on Reader Service Card.

S-M-S

Adjust-A-Angle Adapters with Adjust-A-Pressure Holders solve many welding problems

Change from one electrode spacing to another in a matter of minutes—with the same set-up.

FREE: Write for descriptive data on complete line of resistance welding products.

Another step to better welding.

S-M-S Corporation

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THE NEWEST PORTABLE SPOT WELDER

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Completely new . . . and engineered for today's production demands . . . the Merit Might Midget is the perfect answer to all your welding problems.

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For additional information, ask your jobber or write: The Merit Company, 2124 W. Chicago Ave., Chicago 22, Ill.

Sold through jobbers only
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SPOT WELDER DIVISION

THE MERIT COMPANY
2124 W. Chicago Avenue
Chicago 22, Illinois

For More Information Circle No. 44 on Reader Service Card.

A PRODUCTION FLUX with low glare and low fuming characteristics that assure operator comfort and quality work is available as free working sample. Goldsmith Bros. Division of National Lead Co. is offering these samples of its GB88 flux.

Circle No. 314 on Reader Service Card.

WELDING HOSE DATA is featured in literature available from Swan Rubber Company. A complete line of single and double hose is described and illustrated.

Circle No. 315 on Reader Service Card.

NEW REXARC TWIN liquifluxers and liquiflux which automatically puts the flux in the brazing flame are the subject of 4-page catalog from Rexarc Incorporated.

Circle No. 316 on Reader Service Card.

A COOL electrode holder with long jaw design for reaching hard-to-get-at places is featured in literature from Duro Engineering Co. Square guard, which protects hands from heat and prevents rolling and grounding, is explained.

Circle No. 317 on Reader Service Card.

THE WORK GLOVE AUTOMAT designed to cut a shop's glove costs is described in a 4-page brochure issued by Arlington Industries. The machine is adaptable to any existing glove program—free issue or sale at cost.

Circle No. 318 on Reader Service Card.

CARBON DIOXIDE and its value to industry is the subject of a 24-page booklet issued by the Pure Carbonic Company. The illustrated booklet covers applications and properties of carbon dioxide in gaseous, liquid and solid form.

Circle No. 319 on Reader Service Card.

NEW AND UNIVERSAL holddown clamps that secure work pieces to machine tool tables without heel blocks or shims are featured in a catalog from Insta-Clamp Co. Specifications and prices are given for the clamps and a variety of accessories.

Circle No. 320 on Reader Service Card.

WELDING HOSE for all welding, brazing and cutting operations —manual or machine—are featured in a complete industrial hose catalog issued by Electric Hose & Rubber Co. Featured is the company's Electric Siameez hose that meets IAA Specifications, Grade RM.

Circle No. 321 on Reader Service Card.

HIGH PRESSURE VALVES for oxygen, hydrogen, nitrogen and other high pressure gases are featured in an illustrated 4-page folder from Selwyn-Pacific Co. Complete specifications are given for high pressure cylinder valves and oxygen-line station valves.

Circle No. 322 on Reader Service Card.

CUT-OFF WHEELS and depressed center grinding wheels are the subject of a 4-page catalog issued by Electro-Refractories & Abrasives Corp. Bulletin GC-57

CUT METAL *FAST,* WITHOUT DISTORTION USE MODERN NIBBLERS

They cut 10 gage stainless, 8 gage mild steel, 7 gage aluminum and brass without bending or curling the metal.

They cut 6" (and smaller) radius.

Models are available for cutting corrugated metal, fibre glass and plastic without cracking or chipping. Other models for cutting wire netting, irregular rods, gaskets, etc.

A MODEL FOR CUTTING ¼" COLD ROLLED STEEL AVAILABLE SOON!

Write, wire or call

MODERN MFG. CO., INC.

678 Davisville Road, Willow Grove, Pa.

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If you need casters or wheels—specify Hamilton for the finest quality *at the lowest price*. Prompt quotes. Fast deliveries on direct factory orders. Send today for Hamilton's Caster and Wheel Catalog describing hundreds of sizes, styles and capacities.

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For More Information Circle No. 23 on Reader Service Card.

describes these products, tells how and where to use them.
Circle No. 323 on Reader Service Card.

FOUR METAL WORKERS that can be used to cut mild steel, stainless, aluminum, brass, and copper are the subject of an illustrated brochure issued by Homestrand Machine Tool Corp. Described and illustrated are four sizes of the company's GV metal worker: baby, junior, medium and senior.
Circle No. 32 on Reader Service Card.

NEW, RUGGED THYRATRON which gives greater tube strength and improved reliability is subject of literature. Described and illustrated is General Electric's 2050-A thyratron which is shorter, more compact and sturdier than 2050 tube which it replaces.
Circle No. 22 on Reader Service Card.

HIGH SPEED GRINDING with depressed center abrasive discs is the subject of literature issued by John C. Rollins and Sons to introduce new Torro grinding wheels. Sizes, shapes, and uses are given.
Circle No. 324 on Reader Service Card.

CASE HISTORIES on successful applications of its welding electrodes and wires in a variety of industries are described and illustrated in Bulletin A-2 issued by McKay Company. Last page of the folder lists welding literature available from McKay.
Circle No. 325 on Reader Service Card.

AUTOMATIC BRAZING and soldering machines that can decrease production costs and pile up profits are the subject of literature from Boyd Welding Co. Specifications are given for Model No. 10 (parts move to heat) and Model No. 20 (heat moves to parts).
Circle No. 326 on Reader Service Card.

CONDUIT BENDERS made by Appleton Electric Co. are featured in a pocket-sized catalog. Standard and Powr-Jack units are described and illustrated.
Circle No. 327 on Reader Service Card.

NEW WELDING HEAD for precision assembly of electronic parts is featured in a 24-page catalog from Weldmatic Division of Unitek Corp. Operating details and specifications are given for the Model 1037 bench-mounted welding head.
Circle No. 328 on Reader Service Card.

For More Information Circle No. 55 on Reader Service Card.

Warehouse stocks in all important cities and towns.

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EMPIRE STATE BLDG., NEW YORK 1, NEW YORK
PLANTS: Keokuk, Iowa; Pryor, Oklahoma; and Shawinigan Falls, Quebec, Canada

GV METAL WORKERS...
are preferred by more shops than ever!

Here are a few of the reasons:

- GV metal workers will cut practically any material within their capacity; such as mild steel, stainless steel, aluminum, brass, copper, fibre, etc.
- GV metal workers are precision made of the best Swedish steel. The mechanism is enclosed and operates in an oil bath.
- GV metal workers are made in 5 different sizes. Capacities 5/64", 5/32", 15/64", 5/16".
- GV metal workers are known for their durability, strength, service and simple maintenance.

You simply can't afford to be without at least one GV metal worker, because it pays for itself almost from the very start.

Illustrated brochure on request.

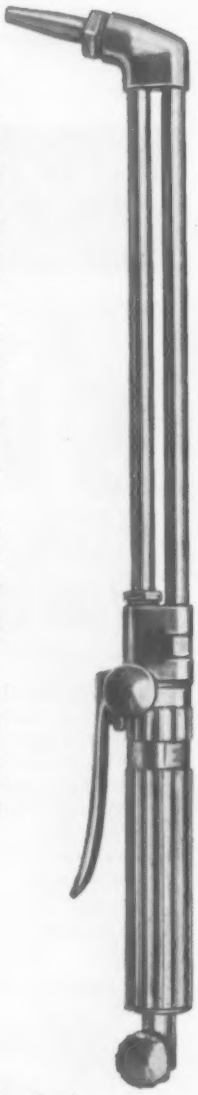
U.S. DISTRIBUTORS

Homestrand
MACHINE TOOL CORP.
392 West Putnam Avenue, Greenwich, Conn. • 203 TOwnsend 9-2558

For More Information Circle No. 32 on Reader Service Card.

VALUE VERSATILITY

···you get more of both in the PUROX TRADE MARK "E" Cutting Torch



When LINDE first offered the PUROX "E" Torch to industry, Ford's model T automobile sold for less than $500. Today's average car costs at least 350% more. *But the price of the "E" torch has gone up only 22%.* Since practically every part in it has been refined for improved performance and longer life, the PUROX "E"—granddaddy of cutting torches—is still one of the biggest oxy-acetylene apparatus values to be found anywhere.

Whatever your present requirements, there's a PUROX "E" Torch to take care of them. Choose a head angle of 75, 90, or 180 degrees in standard 20½-in. length, or a 36-in. model with 90-deg. head. Should new or special needs develop at any time, any model can be adapted to meet them by simply replacing the front-end assembly.

With four interchangeable front ends and 57 different nozzles, the PUROX "E" Torch easily handles any practical hand-cutting job. It cuts steel up to 12 in. thick, washes pads, cuts rivets, gouges, and pierces. *And it performs efficiently on acetylene or any other commercial fuel gas available.*

See the PUROX "E" Torch today at your LINDE Distributor's. Or write for free folder, F-1313. LINDE COMPANY, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y. *In Canada:* Linde Company, Division of Union Carbide Canada Limited, Toronto.

Linde Trade Mark UNION CARBIDE

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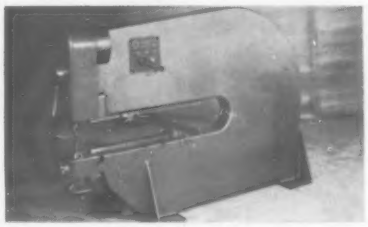
For More Information Circle No. 40 on Reader Service Card.

NEW PRODUCTS



Metal Working Machine

A versatile Swedish-made metal working machine called Junior has been announced by Homestrand Machine Tool Corp. Designed for use in model shops, engineering, research, and development labs, Junior can edge-cut 5/32-inch mild steel. It has a 28½-inch throat and, with available tooling, can do straight, circular, figure, and slot cutting, beading, folding, louvering, nibbling, planishing, and flanging.

Circle No. 32 on Reader Service Card.

Nuclear Welding

A new welding electrode has been developed by International Nickel Co., Inc. Specially developed to meet the stringent requirements of nuclear component fabrication, the BP "85" welding electrode's principal applications in nuclear work will be to join stainless steel to Inconel nickel-chromium alloy, steel to Inconel alloy, and nuclear grade Inconel alloy to itself. It is also expected to find wide use in Inconel alloy overlays on steels.

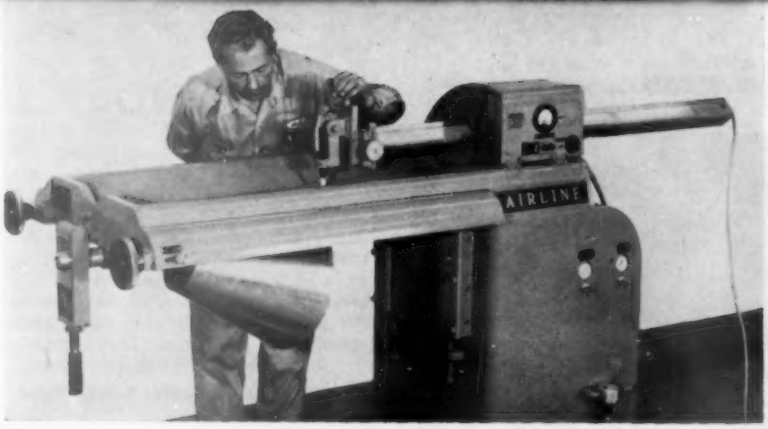
Circle No. 200 on Reader Service Card.

Clamp Has Universal Joint

By fitting their G Clamp with a drop forged and heat treated universal joint, Merrill Brothers have increased its usefulness. The clamp was designed for use where unusual side strains are brought to bear on shackles in rolling drums or tanks while welding, but it has many other uses too.

The Universal Joint Clamp has a safety factor of 5 to 1 and is available in six standard sizes.

Circle No. 201 on Reader Service Card.



New Longitudinal Welding Positioner

A recent development of Airline Welding & Engineering incorporates a miniaturized ram assembly to provide extremely accurate longitudinal movement of welding head in conjunction with a longitudinal welding positioner.

The ram assembly is located above and to the rear of the positioner mainstay. It consists of an integral control and drive mechanism, ram-type boom, and mounting brackets for any one of the small popular TIG machine welding torches.

The location and general configuration of the ram assembly provides maximum visibility and accessibility to the positioner.

An electronic control is used to vary the speed forward or reverse from 4 to 88 ipm with adequate fusing for protection against overload. Ram overrun is prevented by limit switches at each end. The addition of wire is made by a miniature drive system mounted behind the welding torch.

Positioner Model FAL 15300 may be obtained with an effective weld length of 18″ to 42″. (Other models are available with welding lengths up to 144″ long.) The holding capacity is within the .005″ to .187″ thickness range for pieceparts from 1½″ I.D. to 30″ O.D.

For More Information Circle No. 202 on Reader Service Card.

Sander-Grinder

Milwaukee Electric Tool's 6100 9-inch sander-grinder is said to be a perfect tool for grinding down welds. Exclusive coaster-brake clutch drive absorbs backlash and shocks. This doubles gear motor life.

Large cyclonic fan and special exhaust ports provide extra ventilation for cooler running.

Other features include totally enclosed grit-proof, dust-proof trigger switch. Powerful, no-stall motor delivers a full 1½ hp at the spindle . . . 5000 rpm. The tool has ball and roller bearings throughout.

Circle No. 203 on Reader Service Card.

Versatile Welding Rod

A new nickel-silver gas welding rod, Airco No. 21, is being marketed by Air Reduction Sales Co. The 36″ rod, which comes in 1/16-through ¼″ diameters can be used to join 14 different ferrous and non-ferrous metals that can be heated to 1750F. Airco No. 21 is said to have superior flow and bonding properties, can be applied in all positions without fuming or overheating the base metal.

Circle No. 204 on Reader Service Card.

Cloth Clothing

At a cost less than half of leather the new Singer Blackline cloth clothing offers protection plus comfort for inert gas arc welding. In addition it can be used where heat, flame or splashes are present.

Made of flame-resistant, lightweight finely-woven cotton twill cloth in black—the protective color is said to be the best for the welding industry. Capes with bib, aprons and full jackets are available.

Circle No. 205 on Reader Service Card.

KNOWING what you will need IS HIS BUSINESS

Your LINDE Distributor is an independent local businessman who concentrates on knowing what you are going to want and on having it ready for you. He's a welding specialist, too, with wide practical experience and intimate knowledge of local industry. Knowing is part of his job. Maintaining adequate stocks for immediate delivery is another.

So your LINDE Distributor carries a complete line of welding and cutting equipment, industrial gases, welding rods, and supplies. He handles high-quality products of proved efficiency and recommends processes and methods best suited to your needs. His resources, plus the benefits of LINDE's 50-odd years as a leader in welding and cutting, are as near to you as your telephone.

Talk to your LINDE distributor today. Get to know him better. If you can't find his name in your telephone directory, write to: Dept. 311, LINDE COMPANY, Division of Union Carbide Corporation, 30 East 42nd St., New York 17, N. Y. *In Canada:* Linde Company, Division of Union Carbide Canada Limited, Toronto.

Linde

UNION CARBIDE

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Circle No. 41 on Reader Service Card.

NOW—join any commercial metal to any other

All-State provides the right alloy, right finish, right flux, and the right service so you can join any commercial metal to any other—on production line or in maintenance.

If you have a welding, brazing or soldering problem (automatic or manual) there is an answer among All-State's specially produced alloys and fluxes.

This answer may be as near as the nearest of over 1000 All-State distributors here and abroad. Or just write or phone (WHite Plains 8-4646) our Technical Department and Laboratories, White Plains, N. Y. A few minutes and a few pennies might save you thousands of dollars.

To help you know the line and select the alloy and flux best suited for each job, All-State publishes a 56-page INSTRUCTION MANUAL, free to interested users. Also, a special ALUMINUM MANUAL containing 36 pages of data on aluminum alloys and how to join them. If you work with aluminum, ask for a copy.

To serve you, All-State maintains 3 factories, 4 warehouses (White Plains, N. Y.—St. Louis, Missouri — South Gate, California — Toronto, Ontario, Canada) and a central Technical Department and Laboratory at headquarters.

ALL-STATE WELDING ALLOYS CO., INC.
WHITE PLAINS, NEW YORK

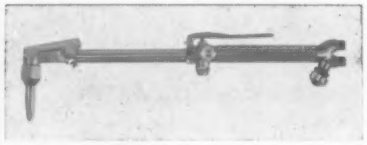
Circle No. 4 on Reader Service Card.

Consumable Welders

A new line of Sigmatic consumable electrode, inert-gas welders has been announced by Linde Company, Division of Union Carbide Corp. to weld the fullest range of metals and thicknesses. Three mountings are available: SWM-11 frame, SWM-12 sled, and SWM-3 cart (shown).

The welders use any shielding gas and have rugged units which feed popular wire diameters, solid or cored. The CP electronic controls of the Sigmatics can be easily converted to constant current power supplies.

Circle No. 206 on Reader Service Card.



Fitter's Torch

The Harris Calorific Company has developed a cutting torch ideal for one hand operation. The torch cutting lever is mounted foreward and on top for better grip and balance, thus, less operator fatigue. The torch injector-mixer completely mixes gases for fast preheats; head mixing of gases eliminates danger of backfire.

The ruggedly built, maintenance-free torch comes in three models: 42 for acetylene, 42-F for propane, and 42-N for low pressure natural gas.

Circle No. 207 on Reader Service Card.

Cleaning and Descaling

A new method of cleaning and descaling has been introduced by the Swissair Tool Corporation. A Swiss-made product known as Vonarx air gun operates on compressed air from any industrial compressor.

This unique tool produces a spring-loaded recoil movement of a series of hardened steel needles located in the head of the air gun. (Non-sparking copper beryllium is also available). The action of these needles is controlled by a trigger on the handle that releases a flow of air which sets the needles into rapid back-and-forth action. The air continues on through blowing the working surface clean from particles. Each needle operates independently from the other allowing them to adjust to the contour of the surface being cleaned. Normal working air pressure is 88 psi and air consumption is 12.5 cfm. Three models weigh 5½, 8½ and 13 lb. respectively.

Circle No. 208 on Reader Service Card.

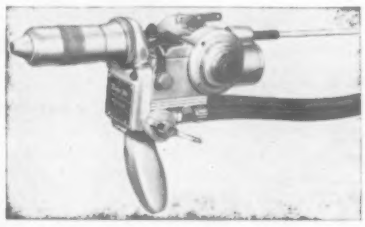
New X-ray Units

Two new Norelco industrial X-ray units (PG-140 and PG 200), designed for minimum weight and to provide high penetrating power and excellent radiographic definition are available from Philips Electronic Instruments.

Completely self-contained, the new units are shockproofed, rayproofed and weatherproofed for outdoor operation. The two tube heads (140 Kv and 200 Kv respectively) are companion units. One control cabinet serves either head.

The PG 140 tube head weighs 55 lbs. and the PG 200 tube head weighs 88 lbs. Cables are lightweight.

Circle No. 209 on Reader Service Card.



Ceramic Spray Gun

A spectacular advance in the construction of the Rokide spray-gun used for applying protective coatings to base materials, especially metals, has been announced by the Metallizing Company of America. This new gun will permit the use of rods up to ¼" in diameter; an auxiliary air supply unit will enable this larger amount of protective material to be applied with greater speed and intensity. The availability of extension-equipment in different lengths permits an easier and more efficient use of the gun in many otherwise unreachable interiors.

Circle No. 210 on Reader Service Card.

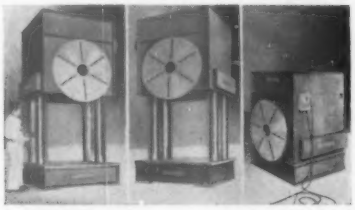
Lightweight Cutting Torch

A new, lightweight cutting torch featuring a built-in pressure control system for smooth, even cutting with various types of fuel gases has been announcement by Weldit, Inc.

Designed to eliminate flashbacks, the versatile new torch, called the "Jet Stream 707", is equipped with an injection-type mixing chamber and valve system which provide a controlled, steady application of oxygen and prevent "jumps"—resulting in accurate uniform cutting action. According to the company, the new torch cuts steel up to 15" thick or more and works equally well with low pressure natural gas, propane and acetylene.

It is available with either 70° or 90° head.

Circle No. 211 on Reader Service Card.



Positioners

Now being manufactured by Aronson Machine Company Inc. are heavy-duty geared-elevation head and tailstock positioners, for positioning weldments such as freight and piggyback cars for down-hand welding. Low horizontal axis height keeps weldment near floor, while elevation feature enables clearance for indexing.

All models have a hollow spindle to allow for the passage of cables, gases or fixtures and have a full complement of accessories to facilitate various applications. Capacities are 6 to 120 tons.

Circle No. 212 on Reader Service Card.

Nuclear Products

A line of new custom equipment for the handling and utilization of very strong radioactive sources is now being offered by Radiation Engineered Services. Included in this new line are industrial gamma radiography machines for radiographic inspection, gamma radiations on various raw materials, products and processes and special radiation monitoring devices for use with the equipment just mentioned.

All items are designed and constructed to customer specifications. The company also offers installation design services.

Circle No. 213 on Reader Service Card.

For More Information Circle No. 25 on Reader Service Card.

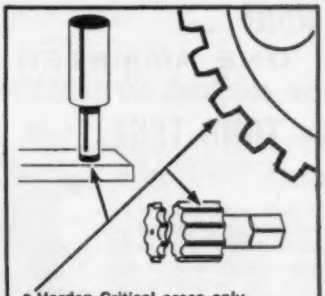
HARD-N-TUFF **HARDENS**
TOOLS and PARTS
RIGHT IN YOUR OWN SHOP

You can get three times more wear from tools and parts by putting every fast-wearing edge and surface through a simple 3-step operation — without special equipment — right in your own shop.

HARD-N-TUFF Steel Hardening Compound:
- Puts a file-hard surface on any steel, cast iron or iron-base metal in minutes.
- Leaves metal core tough, resilient, avoiding breakage.
- Hardens only the critical cutting, bearing or impact area.
- Super-hard surface will not crack or scuff off.
- Does not affect critical shapes or dimensions.
- Safe, non-toxic.

HARD-N-TUFF nitrides, chromizes and carburizes in one easy operation. Simply heat part, apply HARD-N-TUFF and reheat, then quench. That's all there is to it!

Order Your Trial Supply NOW.
Get 3 oz. cans for only $2.00 or
Get 1 lb. cans for only $8.95



- Harden Critical areas only.
- Leave Tough Cores

Use HARD-N-TUFF on dies, jigs, fixtures, gears, bearings — any impact cutting or bearing surface.

IT'S THE SURFACE HARDNESS THAT COUNTS

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Same Spec'd
They mean National Carbide's calcium carbide— Real potent... it's hot-crushed!
All you want— when you want it. In the RED DRUM. Wire for supplier...
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For More Information Circle No. 49 on Reader Service Card.

Circle No. 13 on Reader Service Card.

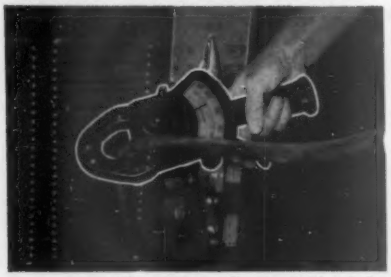


Photo Courtesy The Lincoln Electric Co.

now . . .
ONE AMMETER
for AC/DC WELDERS
Only TONG-TEST
measures both AC and DC

Weld with confidence. Use the exact amperage — no more, no less—to assure welding quality. Prevent costly rejects by controlling the welding current (AC or DC) with one TONG TEST AMMETER. Simply snap tongs around electrode cable — read amps instantly and accurately. No electrical connections required, cannot burn out. Interchangeable ranges up to 1000 amperes.

Write for Catalog IW-400

COLUMBIA ELECTRIC MFG. CO.
4545 Hamilton Avenue • Cleveland 14, Ohio

No Other Product Can Do
a Galvanizing Job Like
Galvalloy
Does - HERE'S PROOF

Heat welded seam on galvanized sheet to 800° with Torch

Rub GALVALLOY against heated surface as shown — new spread with wire brush for a bright finish.

GALVALLOY Covers the Same Amount of Area with 1/5 the Amount of Material.

Send today for Testing Sample and you'll learn Why GALVALLOY has no equal for ANY Galvanizing Job.

METALLOY PRODUCTS CO.
1233 S. BOYLE AVE., LOS ANGELES 23

Circle No. 46 on Reader Service Card.

Mechanized Hand Cutter

There's a new tool designed to simplify the work of pipe, tank, and plate fabricators: Mechanized Hand Cutter. Steffan Manufacturing Corporation designed it first to cut round openings in tanks and large pipe, but saw to it that the tool cut flat plate as fast and as well.

A magnetic radius rod permits center fulcrum to rise and fall with the contour of the tank. The opening it cuts is round. A variable speed motor permits the oxyacetylene torch to cut different thicknesses. Unit weighs 23 lb., comes ready to use.

Circle No. 214 on Reader Service Card.

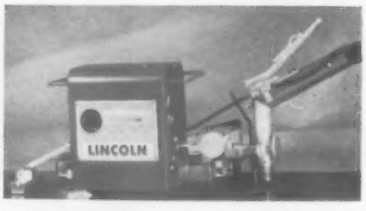
Temperature Indicator

Thermomelt is a precision temperature indicator designed to tell when a surface has reached a specific temperature. Available in stick, pellet and liquid form. Thermomelt is provided in a wide choice of Fahrenheit ratings from 113° to 2000°, which according to the manufacturer will cover all requirements in the heat treating and heat-processing fields.

The metal surface is marked with the stick or liquid or a pellet is placed on the surface. When the surface reaches the wanted temperature, the mark (or the pellet) quickly liquefies.

The Thermomelt stick comes in a metal holder, which lets the user dispense the stick as needed and also prevents breakage. The liquid is packaged in a glass bottle with a brush dispenser in the cap. Pellets are packaged 20 to a plastic tube.

Circle No. 215 on Reader Service Card.



Self-Propelled Trackless Carriage

The Lincoln Electric Company of Cleveland, Ohio announces the development of a self-propelled trackless carriage for operation in conjunction with their ML-3 mechanized Squirt Welder. The new Squirtmobile supports, advances and guides the welding gun along the joint, in effect producing full automatic submerged arc welds.

This 37 pound, compact tractor requires no supporting fixtures. The equipment can be easily moved to the job site and quickly placed in operation.

The carriage travels on a pair of magnetized rollers. These rollers prevent slipping and bouncing and yet move the trackless Squirtmobile at speeds ranging from 7 to 70 inches per minute. The magnetic force is great enough to support the weight of the unit, ML-3 gun, and cable assembly for out-of-position welding. Trackless travel along the inclined leg of a flat position fillet or the vertical leg of a horizontal fillet is a simple matter. Uphill travel is practical within the limitations of the submerged arc process.

Circle No. 216 on Reader Service Card.

Bench Welding Head

A new air-operated welding head for the production welding of small parts has been developed by Ewald Instruments. The new model WHD 4AP head has electrode pressure adjustable from one to 20 lbs. indicated on a calibrated scale. The pressure arm moves in linear ball bushings and has very low inertia (4 oz) to insure fast follow-through forging action.

Air operation reduces operator fatigue and eliminates electrode bounce.

The head can be used with stored energy power supplies up to 200-watt-seconds or AC welders up to 2½ KVA at welding times up to 10 cycles.

Circle No. 217 on Reader Service Card.

Abrasive Disc

Manhattan Rubber Division of Raybestos-Manhattan, Inc. has developed a new depressed center abrasive disc reported to cut and remove metal faster than any similar type wheel.

Other features claimed for the Fast-Cut Moldisc are: reinforced for maximum safety, uniform cutting action, longer life, less operator fatigue.

The new wheel is designed for use in fabricating shops for grinding welds and beveling edges, and in foundries for notching gates and risers and trimming fins.

Fast-Cut Moldiscs are available in 7" and 9" diameter sizes in ⅛", 5/32" and ¼" thicknesses.

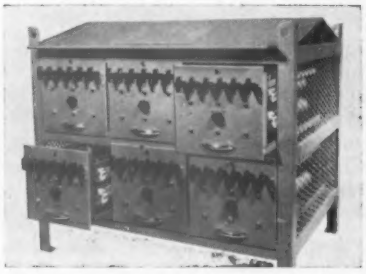
Circle No. 218 on Reader Service Card.

Face Shield Window

Multi-Ply is the name given to this new line of face shield windows. To test its resistance to heat, the manufacturer, Chicago Eye Shield, placed a propane blow torch flame in direct contact with a Multi-Ply window. Three holes were burned in the same window. Average time required to penetrate the window was 15 seconds. Under identical test conditions, an ordinary cellulose acetate window melted in 7 seconds and continued to burn after the flame was removed.

Multi-Ply windows are available in six basic face shields featuring fiber glass crowns and shells. Face shields have a Nylanite headgear with pivoting cross band adjustable for height and offset cambered rear headband. Headgear also fits hard hats.

Circle No. 219 on Reader Service Card.



Multi Arc Welding

An improved line of multi-arc welding control units has been introduced by J. B. Nottingham & Co., Inc.

The new "Weldline" resistor units are available in compact lightweight 6-operator, and 2-operator models. Switches on the front of each drawer in the unit make it easy for each operator to vary the current in steps as small as one ampere for accurate control of all arc welding processes.

Enclosed in a welded steel frame with expanded-metal bottom and side panels and a solid steel top with side louvres for additional ventilation, the units are convection-cooled.

Circle No. 220 on Reader Service Card.

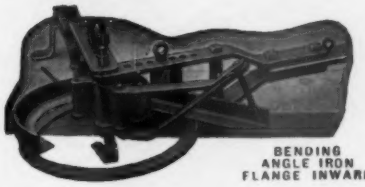
Improved Abrasive Discs

A new blanking method that eliminates structural change to disc fibre backing is used by Michigan Abrasive Company on their Red Coat Fibre abrasive discs. Advantage: Discs can withstand their periphery to minimize grain loss. Discs come in standard sizes with full or spaced coating of aluminum oxide abrasive in a variety of grit sizes.

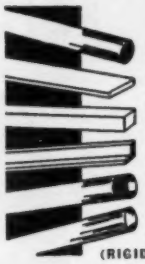
Circle No. 221 on Reader Service Card.

For More Information Circle No. 33 on Reader Service Card.

HOSSFELD #2 Universal®
Iron Bender Bends



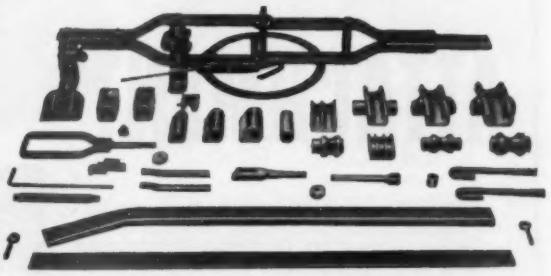
BENDING ANGLE IRON FLANGE INWARD



ROUNDS
FLATS
SQUARES
BAR STOCK
ANGLE IRON
PIPE
TUBING & CONDUIT
(RIGID OR THINWALL)

35 Years Of Metal Bending Experience

- Wrenchless, it's ready to use.
- Practical, it's quickly set up.
- Adaptable, it replaces special equipment.
- Versatile, 147 different dies are available.
- Dependable, it's a "must" for maintenance and limited production work.
- Invaluable, optional hydraulic equipment makes the job easier.
- Indispensable, it's as necessary as a shop vise.



BENDER SHOWN WITH REGULAR EQUIPMENT

FREE: WRITE FOR BENDER BULLETIN

HOSSFELD MFG. CO.
436 W. THIRD STREET • WINONA, MINNESOTA

LOOKING FOR THE BEST? *Buy*
INDEPENDENT
Acetylene Cylinders

- Unconditional Guarantee
- Proven Filler - No "Spitting"
- No voids - No soft Spots
- Seamless Cylinders for Durability
- Alloy shells for Lighter Weight
- Cylinder Shells - Meet all ICC Requirements
- All Cylinders "WHEELABRATOR" cleaned
- Standard Sizes in Stock - Special Sizes on Request

Independent also manufactures Low Pressure Acetylene Generating Plant Equipment.

SEND YOUR INQUIRIES TODAY TO

INDEPENDENT ENGINEERING COMPANY, Inc.
Manufacturers of
CONSULTING IECO DESIGNING RESEARCH
CYLINDERS AND GAS PRODUCING EQUIPMENT
ACETYLENE • OXYGEN • NITROGEN • ARGON
O'FALLON 2, ILLINOIS

For More Information Circle No. 34 on Reader Service Card.

NEW telescoping SIDE ARM ATTACHMENT

Smooth functioning lightweight side arms permit goggles to rest comfortably on user's face *or anywhere on top of cap*. Gentle but efficient spring tension in *telescoping* arms can be varied as required. Adjusts to every face!

EFFICIENT, ADJUSTABLE

Solo goggle-Safety Cap Combination (F-4055-P-2Q) with side arm attachments uses QUICK-LOK Joints for quick and easy attachment or detachment. Solo goggle "picture window vision", high strength, impact- and flame-resistant one-piece shell holds any standard 2" x 4¼" lens. This model gives complete and comfortable head and eye protection.

These Fibre-Metal Attachment Designs Give You Maximum Safety, Comfort, Convenience and Economy

"SeesAll" Goggles (F-4050-P-2Q) have a new slanted lens angle for best viewing. Improved contour gives unmatched comfort and fit over prescription glasses!

The *Quick-Lok* "on-off" attachment is quick to attach, rugged and positive, and easy to use. Attaches Safety Caps to welding helmets, face shields, safety masks...and now to goggles! *Gives you widest safety usage on any and all jobs!*

Write for Bulletins or ASK YOUR WELDING & SAFETY DISTRIBUTOR

The FIBRE-METAL Products Company | CHESTER PENNA.

In CANADA: Fibre-Metal (Canada) Limited, Toronto

For More Information Circle No. 20 on Reader Service Card.

Magnetic Particle Tests

Two magnetic-particle testing units said to provide economical detection of tiny flaws as deep as one-half inch below the surface are part of the new line announced by Picker X-Ray Corporation.

The stationary unit, called the Ferroscope, detects inclusions, seams, critical weld defects and heat treat, grinding, forming and fatigue cracks. It has 6,000 ampere D. C. output and meets Mil-1-6867A Type II equipment specifications.

The mobile Ferroscope is used to find defects primarily on large rough parts and other assembly items that must be checked on the spot. It moves on eight-inch rubber casters. Eye-bolts are provided for crane handling. The unit has a 3,000 ampere output for both A.C. and half-wave D.C. outlets.

Circle No. 223 on Reader Service Card.

New, Rugged Thyratron

The new 2050-A Thyratron developed by General Electric's Electronic Components Division gives greater tube strength and improved reliability. Socket-wise, the new tube is fully interchangeable with Type 2050, but is 30 percent shorter and has 18 percent less diameter. This greater compactness adds strength to withstand vibration.

There is double bracing of tube structure. The 2050-A bottom mica fits snugly against the glass envelope—unlike the 2050 mica, which floats. Tube cage is held firmly in place.

Clean, compact base design means short leads that are all internal, requiring no spaghetti insulation as found in the old-style long-lead 2050.

Circle No. 22 on Reader Service Card.

Austentic Manganese Welding

The McKay Company has developed a composite nickel-manganese electrode (mild steel core wire, alloy in the coating) for fabrication and surfacing manganese steel. The electrode's low-hydrogen coating permits its use on either a.c. or d.c. reverse polarity current in all positions.

Hardalloy 118 differs from other nickel manganese electrodes in that alloy balance is precisely controlled through special composite-coating techniques.

An all-weld-metal tensile of Hard-

alloy 118 will have 60,000 psi yield, 127,000 psi tensile, 50% elongation, and up to 22 RC hardness. Work hardening runs this hardness up to 50 RC. Deposits have excellent shock and impact resistance.

Hardalloy 118 saves the cost of expensive stainless electrodes, with equal or better results. It joins manganese to manganese or manganese to steel.

Circle No. 225 on Reader Service Card.

Hold Down Clamps

Insta-Clamps are fast and simple to operate; they clamp without shims to the full capacity of the clamp. They will not clutter work areas or tip over when clamping on to narrow grooves, ledges or corners. Insta-Clamps are made by the Insta-Clamp Co. of heavy duty steel forgings. Steel washers distribute pressure evenly and locate the pressure tangent point automatically. Two or more clamps lock any work piece in position.

Circle No. 226 on Reader Service Card.

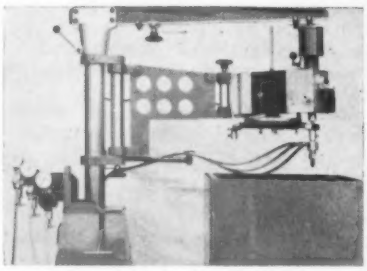
LPG Space Heater

Stow Mfg. Company has just put out a new portable space heater that burns liquid petroleum gas. This new heater can be used in maintenance shops, warehouses, welding shops or any unheated area.

The new Model LPG 200 is multipurpose, radiant and recirculating. It weighs only 45 pounds. Thermostats (optional) can be added where temperature control is desired.

Unit has a ⅛ hp motor which drives a fan to circulate warm air at the rate of 2,000cfm. The unit develops 200,000 BTU's.

Circle No. 227 on Reader Service Card.



Automatic Cutting Machine

A new heavy duty, oxygen cutting and duplicating machine, designed for single or batch cuts of profile sections, has been announced by Milo Mfg. Co. Machine uses iron or steel templates, a line on the plate, or an automatic circular cutting attachment. It will make clean cuts in ⅛-to 4-inch steel.

Operating normally with acetylene, machine can be used with any fuel gas. Cutting table is separate and portable.

Circle No. 228 on Reader Service Card.

For More Information Circle No. 2 on Reader Service Card.

DOC TUFFY TO THE RESCUE

WELDING ENGINEER
DOC! I'VE GOT A MILLION JOBS TO DO! JUST CAN'T GET TO THOSE RESISTANCE WELDING SPECIALS!
YOUR PROBLEM HAS A SIMPLE, PRACTICAL SOLUTION... CALL A TUFFALOY SPECIALIST!

Why burden your staff with the puzzles of resistance welding electrode design? Free up your engineers for the bigger, more pressing jobs.

Call in the Tuffaloy expert. He'll give you practical, money-saving electrode designs. Write or call your local Airco or Tuffaloy office. Today.

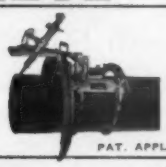
TUFFALOY.

AIRCO

AIR REDUCTION SALES COMPANY
A division of Air Reduction Company, Incorporated
150 East 42nd Street, New York 17, N. Y.
Air Reduction Pacific Company • Air Reduction Canada Limited

H&M PRODUCTS FOR PROFITABLE PIPE CUTTING AND BEVELING

STD. MACHINES



PAT. APPLIED FOR

FAST, accurate cutting and beveling of all sizes of pipe from 1½"-36". Simple operation . . . operator can master machine in a matter of minutes.

"BEVEL-LAND" GRINDER

PATENT NO. 2,869,293

No more time consuming handwork. "BEVEL-LAND" smooths pipe cuts and accurately places the lands on bevels in a matter of seconds.

OUT-OF-ROUND

Insures even, accurate cuts of irregular pipe. Roller rides pipe surface . . . makes cutting easy, simple. Fits all H&M Machines.

PATENT NO. 2,843,373

SHAPE CUTTER

Accurately cuts saddles, tees, els and other irregular shapes. Lightweight, extremely portable . . . fits all H&M Machines.

PATENT APPLIED FOR

WRITE FOR CATALOG SHEETS AND PRICE LISTS ON THE COMPLETE H&M LINE.

H&M TM Reg

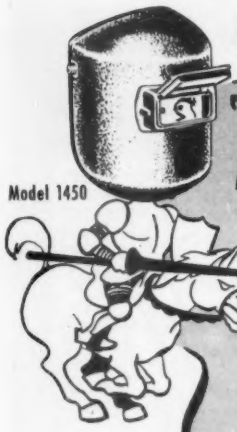
PIPE BEVELING MACHINE COMPANY
311 E. Third St. DI 3-0241
TULSA, OKLAHOMA

For More Information Circle No. 30 on Reader Service Card.

For More Information Circle No. 14 on Reader Service Card.

King Arthur claims:

"I don't jest when I joust, no foolin' Dockson HELMETS are ye best for protection and comfort."



Model 1450

Model 1475

Model 1225

Complete, comfortable protection against sparks, flash and dangerous rays. Light, roomy, adjustable, easy, one-hand raising. Stays where you want it.

Built to last of tough, one-piece, rivetless, moulded fibre.

Dockson CORPORATION

There's a style to suit your need. Write for catalog 56-06.

3839 Wabash Ave., Detroit 8, Mich.

PLASTIC WELDING

VALUABLE NEW DATA

During the last few years gas welding of plastics has been applied with particular success to a large and ever-increasing variety of constructions where it has proved invaluable. Information on this subject is rather scarce. This manual will be extremely valuable to practical welding people and to engineers who intend to incorporate plastic materials into their designs.

PRICE $6.00

WELDING DESIGN & FABRICATION

812 HURON ROAD
CLEVELAND 15, OHIO

Remove Welding Fumes at the Source... with RUEMELIN FUME COLLECTOR

Welding shops equipped with Ruemelin Fume Collectors are assured of a clean shop atmosphere. Noxious fumes, heat and smoke are eliminated AT THEIR SOURCE. Improves working conditions . . . lessens fatigue . . . paves the way for increased plant production. Especially helpful in winter months when windows and doors are closed.

Note the new spring-loaded counterbalance mechanism which makes Fume Collectors much easier to handle.

WRITE FOR DETAILED INFORMATION

RUEMELIN MFG. CO.

3932 N. PALMER STREET • MILWAUKEE 12, WIS., U.S.A.

Mfrs. & Engineers • Sand Blast & Dust Collecting Equipment

Circle No. 54 on Reader Service Card.

Butt Welder

An automatic air-operated butt welder which is fast, sturdy and easy to set up and operate has been introduced by Peer, Inc. The B10 welder is a heavy-duty butt welder that maintains preset precision alignment of parts. Clamping jaws are actuated by individual air cylinders to assure proper clamping at all times. Upset pressure is also air operated by a third independent air cylinder with complete control of both upsetting pressure and degree of upset.

The motion of the movable jaw is straight-in-line and not through an arc. Precision alignment is maintained by anti-friction slides consisting of ball bearings riding in hardened and ground races.

A novel, non-critical automatic welding actuator has been built into this butt welder, eliminating the critical air pressure switches used on previous machines.

Circle No. 229 on Reader Service Card.

New Welding Machine Performance Checkers

To establish the magnitude of secondary currents in standard resistance welding and of secondary currents and tip pressure in gun-type resistance welding, Control Devices, Inc. has introduced two new transducers or transmitters.

Designed for use with an oscilloscope or a direct-writing recorder, the first of these accommodates electrode holders from 1¼" to 1¾" diameter. It is held in position by spring clips which automatically adjust to different size holders and is calibrated in terms of millivolts per thousand amperes.

The second instrument is designed primarily for use on gun-type resistance welders but adaptable to other types of resistance welders. It registers tip-pressure and secondary welding currents simultaneously, recording them on a double channel direct-writing oscillograph.

Circle No. 230 on Reader Service Card.

see page 52
for Useful Literature

Curtiss-Wright Holds Training Course

PRINCETON, N. J.: A course in industrial isotope radiography was given here June 6 through 10 at the laboratories of Curtiss Wright's Princeton Division. The course covered source selection, darkroom techniques, and instrumentation. Newest developments in shop and field testing equipment, including equipment using Cobalt 60 and Iridium 192, were used as teaching aid and was operated by students.

Eisler Acquires Harrison Transformer

DOVER N. J.: All assets of the Harrison Transformer Co., Springfield, N. J., have been acquired by the Eisler Transformer Co., Dover, according to Dr. Charles Eisler, chairman of the board. With this acquisition and more modern equipment, Eisler will be able to produce larger transformers.

The firm's newly acquired plant occupies a modern 34,000 square foot building. It will employ 125 men and will ship more than a million dollars worth of transformers by the end of this year.

Eutectic's Training Center Serves Four States

MINNEAPOLIS: Eutectic Welding Alloys Corp., Flushing, New York, has established a direct educational and warehouse service in a four-state area surrounding the Twin Cities. The new facilities opened here on May 2.

American Brass Builds Research Center

WATERBURY, CONN.: A new $1,500,000 research center will be built here by American Brass Co. Scheduled for completion in 1961, the center will house metallurgical, corrosion and chemical laboratories and equipment for experimental production of new products.

Circle No. 10 on Reader Service Card.

BATEMAN BANTAM IRON WORKER

THE ONLY IRON WORKER OF ITS KIND ON THE MARKET TODAY

No Grinding Necessary After Cut. One Stroke Cycle Clutch Operated by Hand or Foot.

The Bateman "Bantam" cuts 2" x 2" x ¼" angles and ¼" x 4" flats. Standard punches will fit this machine. The Coper will cope 1¼" through ⅛" material. It will punch ½" hole through ¼" material. With the clutch open, the Bantam will make 44 strokes per minute. It is made of high-grade cast iron, with the clutch, pin and dog made of hardened steel. The blades are made with tool steel. It is powered with a fly wheel and gear drive, and uses a small ¾ hp motor, 1750 rpm.

Bateman Bantam with punch....$575.00
Shear only $495.00
Shipping wt. 750 lbs.

BATEMAN FOUNDRY & MACHINE
MINERAL WELLS, TEXAS

BECKER *Keen-Cut* Electrodes
for use in

CARBON ARC-AIR JET GOUGING

KEEN-CUTS—for the best characteristics of carbon and graphite in a carbon arc cutting electrode. Higher current capacity ... longer life ... shorter cutting time ... greater material removal ... smooth surface gouge ... controllable accuracy ... hot stable cutting arc ... elimination of smoke and gases.

And they're low in cost. Try BECKER KEEN-CUT ELECTRODES—black or copper coated, standard diameters, 12" lengths in 150 to 1400 amp. range—for the most efficient, labor-saving electrode in carbon arc/compressed air cutting.

A COMPLETE LINE OF CARBON AND GRAPHITE WELDING SUPPLIES—carbon and graphite electrodes, carbon rods and plates, welding paste, graphite cores and chills, graphite powder and particles of any mesh.

Write for Catalog

BECKER BROTHERS CARBON CO.
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Circle No. 11 on Reader Service Card.

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AMBRAZE QUALITY BRAZING ALLOYS

Fully Guaranteed Materials
Meets all Gov't, AWS, ASTM Specifications.

Low Fuming Bronze Rod—Aluminum—Nickel Silver—Silver Solder—Flux—Phos Sil 0,2,6,15 Alloys

Write today for full details
AMERICAN BRAZING ALLOYS CORP.
P. O. Box 11 Pelham, N. Y.

Ransome Appoints Two New Distributors

SCOTCH PLAINS, N. J.; The appointment of two new distributors has been announced by the Ransome Company. Named were J. A. Cunningham, Philadelphia, in Eastern Pennsylvania and southern New Jersey and Brooks Welding Supply Co., Chattanooga, in central Tennessee.

At the same time Ransome announced that the Petro-Fouga Company of Paris, France, will manufacture Ransome's standard line of positioners, turning rolls, welding head manipulators, and other Ransome welding products.

United Specialties Appoints Detroit Rep

EL DORADO, ARK.: Industrial Equipment Co., Detroit, has been appointed a manufacturer's sales representative for the state of Michigan by United Specialties, Inc., manufacturers of industrial hose and cable reels.

Linde Builds Rail Welding Plant

HARRISBURG, PA.: A Ribbonrail Welding plant being constructed here by Linde Company, Division of Union Carbide Corp., will produce continuous-welded rail on a contract basis with the Pennsylvania and other railroads.

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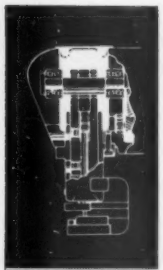
CUT ¼ INCH STEEL PLATE EASILY AND IN ABSOLUTE SAFETY

with the **FENWAY heavy duty NIBBLER**

MODEL EHN



The new, lightweight Fenway ¼" Nibbler cuts through ¼" cold or hot rolled steel plus 5/16" aluminum, quickly and easily. Also cuts 8 gauge stainless. Its special design provides absolute safety to the operator and will cut without distortion to material. Clean cutting action reduces need for grinding and buffing edges. Has minimum cutting radius of 8". Weighs only 20 lbs. SEND FOR COMPLETE SPECIFICATIONS OR ASK FOR FREE DEMONSTRATION IN YOUR AREA.

Other Fenway Nibblers are available for a variety of cutting jobs ...help reduce costs as much as 75%.

FENWAY MACHINE CO., INC.
3107 N. Broad St., Phila. 32, Pa.

Circle No. 19 on Reader Service Card.

cut weld cleaning time by 85%

THROW AWAY YOUR COLD CHISEL AND WHISK OFF WELD SPATTER WITH A DRY RAG! Protect-O-Metal spatter-proofing compounds make weld cleaning a breeze. Improve your welds at the same time... P-O-M compounds quiet the arc, improve oxidation and annealing scale, cause no porosity. No smoke, odors, or fumes.

P-O-M No. 2. Non-inflammable, non-toxic, water-soluble paste. Inorganic. Thin before applying and start welding at once. $3.40 per gallon, f.o.b. Dayton.

P-O-M No. 8. Rust- and corrosion-resistant resin base compound. Comes ready to use. Safe for all metals. Good paint primer; permits outdoor storage of sub-assemblies. $3.45 per gallon, f.o.b. Dayton.

Money-Back Trial Offer. Order a trial gallon of each today for testing in your shop. We'll cancel the bill if you're not satisfied.

Prevents Heat Treat Scale . . . up to 1500°F. Brush on, heat, brush off. All metals.

PROTECT-O-METAL

G. W. SMITH & SONS, INC. • 1701 Spaulding Rd., Dayton 3, Ohio

Circle No. 57 on Reader Service Card.

PHOTOS courtesy Michael J. Scilingo

CADDY TYPE K-35 (300 AMP) ELECTRODE HOLDER being used to weld angle iron stiffeners for reinforcing bottom of "STEELDOMES". Air hose coupling in center also tack welded.

CECO STEEL PRODUCTS CORPORATION

uses CADDY® ARC WELDING ACCESSORIES

CECO STEEL PRODUCTS CORPORATION, Chicago 50, Ill. is nationally known for their steel and aluminum windows, hollow-metal doors, steel forms, steel joists and roof decks, roofing products and accessories.

Illustrated here are sequence photos showing how CECO's "STEELDOME" CEILINGS are constructed. This particular installation is one of the Illinois Tri-State Tollway Restaurants.

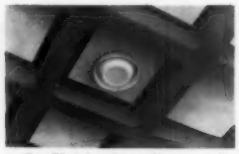
CECO used complete CADDY ARCWELD CIRCUITS and K-35 (300 AMP) Electrode Holders for welding stiffeners in reinforcing the "STEELDOMES". Operators prefer the CADDY K-35 because of its coolness, while central maintenance claims CADDY's long trouble-free service drastically reduces holder downtime.

1. CECO's air-jet "STEELDOMES" being butt positioned on wooden runners prior to concrete pouring.

2. Steel reinforcing rods being laid around "STEELDOMES".

3. "STEELDOMES" coated with oil to assure clean smooth surface when removed. Note air-jet holes in centers.

4. Compressed air forces "STEELDOMES" away from dry cement (wooden runners already removed)



5. Finished ceiling with accoustical tile and lighting fixtures installed.

CADDY® Arc Welding Accessory Div.

Erico Products, Inc.

2070 E. 61st Place • Cleveland 3, Ohio

IN CANADA: ERICO INCORPORATED, 7 Superior Ave., Toronto 14, Ontario, Canada

For More Information Circle No. 17 on Reader Service Card.

announcing . . . the H & M "BEVEL-LAND" GRINDER

patent protected

• for fast cleaning of pipe cuts!
• for accurate placing of lands on pipe bevels!

the sensational, new PROFIT-BUILDER from the famous H&M line of quality pipe cutting and beveling equipment

- PIPE CUTTING AND BEVELING MACHINES for pipe from 1½" to 36"
- SHAPE CUTTER
- OUT-OF-ROUND
- FLEXIBLE SHAFT
- MOTORIZED UNITS
- BOXES • PIPE DOLLIES • CLAMPS • TONGS

WRITE TODAY FOR DETAILS ON PROFITABLE H & M DEALERSHIPS

Patent No. 2,869,293

EASY TO OPERATE! LIGHTWEIGHT!

Eliminates Handwork on All Types of Pipe — from 6" to 30"

"Greatest advance in pipe fabricating!" — is the sales-building name the "Bevel-Land" has built for itself in just a few months! YOU can profit from this fast-selling new equipment, as well as the other H & M sales-leaders.

H&M PIPE BEVELING MACHINE CO.

311 EAST THIRD ST. Diamond 3-0241

TULSA, OKLAHOMA

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